VOLUME 29 MAY 1936 NUMBER 5

Southern Medical Journal

Journal of the Southern Medical Association

Copyright, Southern Medical Association, 1936. Published monthly by the Southern Medical Association, Empire Building, Birmingham, Alabama. Annual subscription $4.00. Entered as Second-Class Matter at the Post Office at Birmingham, Alabama, under Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized December 20, 1921.

Southern Medical Association, Thirtieth Annual Meeting, Baltimore, Maryland, November 17-20

TABLE OF CONTENTS

Readjustments in the Thoracic Cage and Its Contents Following Total and Partial Pneumonectomy. William F. Rienhoff, Jr., Baltimore, Maryland 445

Discussed by Evarts A. Graham, St. Louis, Mo.; I. A. Bigger, Richmond, Va.

Recognition of the Modern Treatment of Broken Hips. Lawson Thornton and Calvin Sandison, Atlanta, Georgia 456

Discussed by Austin T. Moore, Columbia, S. C.

The Diagnostic Value of a Skin Lesion, Tuberculid. Howard Hailey, Atlanta, Georgia 460

The Roentgen Ray Examination of the Colon in the Study of Amebiasis. Joseph C. Bell, Louisville, Kentucky 462

Discussed by Henry E. Meleney, Nashville, Tennessee.

The Epidemiology of Endamoeba Histolytica Infection in Two Rural Georgia Counties. D. L. Seckinger, Atlanta, Georgia 472

Discussed by Charles F. Craig, New Orleans, Louisiana.

Concluded on Next Page

Berens' Eye Diseases

By 80 INTERNATIONAL AUTHORITIES

This is a *complete book* on the Eye and its Diseases, written by 80 authorities of international reputation and edited by Dr. Conrad Berens of New York City. It includes embryology, anatomy, postnatal development, physiology and physiologic optics; examination of the eye, refraction, clinical interpretation of the symptoms, detailed discussions of the individual eye diseases, and *both medical and operative treatment.*

Octavo of 1250 pages, fully illustrated. By 80 International Authorities. Edited by CONRAD BERENS, M.D., F.A.C.S., Ophthalmic Surgeon and Pathologist, New York Eye and Ear Infirmary. Ready soon.

J. A. MAJORS COMPANY

1301 Tulane Ave., New Orleans, La.
Medical Arts Bldg., Dallas, Texas

TABLE OF CONTENTS—Continued

The Nervous Control of the Coronary Circulation and Its Clinical Significance. Chas. W. Greene, Columbia, Missouri 478

Recent Advances in Diagnosis and Treatment of Coronary Thrombosis. Louis Faugeres Bishop, Jr., New York, New York 483

Advances in the Dietary Management of Diabetes. Cyril Mitchell MacBryde, St. Louis, Missouri 488

Gallbladder Disease: How Diagnose It? How Treat It? Lay Martin, Baltimore, Maryland 492

Discussed by Hugh J. Morgan, Nashville, Tennessee.

The Internist's Attitude Toward Unusual X-Ray Findings in the Appendix Area. Harold Bowcock, Atlanta, Georgia 497

Discussed by Trimble Johnson, Atlanta, Ga.; Henry M. Winans, Dallas, Tex.

Acute Appendicitis in Children. Philip F. Barbour, Louisville, Kentucky 500

Discussed by J. Buren Sidbury, Wilmington, N. C.; Roy E. de la Houssaye, New Orleans, La.; Warren Cole, St. Louis, Mo.

Two Unusual Cases of Anemia in Children. L. L. Lee, San Antonio, Texas 504

Diagnostic Measures in Atopic Infantile Eczema. Herbert J. Rinkel, Kansas City, Missouri 507

Discussed by Carroll M. Pounders, Oklahoma City, Okla.; Hugh L. Dwyer, Kansas City, Missouri.

Ununited Fractures. Edwin W. Ryerson, Chicago, Illinois 512

Indications for Operation in Renal Stones. R. M. LeComte, Washington, D. C. 515

Discussed by I. G. Duncan, Memphis, Tenn.; Linwood D. Keyser, Roanoke, Va.; Bransford Lewis, St. Louis, Mo.; B. Weems Turner, Houston, Tex.; Arthur C. Simon, Decatur, Ill.; Wm. S. Ehrich, Evansville, Ind.; Hubert K. Turley, Memphis, Tenn.

Some Observations on the Jameson Recession Operation for Strabismus. J. W. Jervey, Jr., Greenville, South Carolina 520

Discussed by Edward H. Cary, Dallas, Tex.

A General Consideration of Defective Hearing and Deafness with Particular Reference to Etiology. N. E. Hartsook, Johnson City, Tennessee 521

Discussed by G. H. B. Terry, Oteen, N. C.

Three Years' Affiliation of a Community Chest Mental Hygiene Clinic with the Department of Psychiatry in a Medical School. Spafford Ackerly, Louisville, Kentucky 527

Discussed by W. E. Gardner, Louisville, Ky.; Harry Andrews, Louisville, Ky.

Public Health Significance of Our Newer Knowledge of Yellow Fever. Bolivar J. Lloyd, Washington, D. C. 533

Discussed by J. A. LePrince, U.S.P.H.S., Memphis, Tenn.

Nitrogen Retention Due to Hypothyroidism: Report of Case. John W. Boggess, Jr., Guntersville, Ala. 536

The Uses of Colposcopy, with Demonstration of a New Colposcope. George Gellhorn, St. Louis, Missouri 538

A New Direct Blood Transfusion Instrument. Sidney Meeker, Memphis, Tennessee 539

EDITORIALS 541

Liver Extract and Intestinal Function
Sex and an Arterial Disease
Gleanings from Recent Journals
Twenty-Five Years Ago

BOOK REVIEWS 545

SOUTHERN MEDICAL NEWS 546

HARVEY B. STONE
PRESIDENT

ALTON OCHSNER
SECRETARY

THE ANNALS OF SURGERY

ANNOUNCES WITH APPRECIATION, THE HAPPY CONSUMMATION OF AN AGREEMENT BY WHICH THIS OLDEST SURGICAL JOURNAL IN AMERICA BECOMES THE OFFICIAL PUBLICATION OF THE

SOUTHERN SURGICAL ASSOCIATION

THE MAY ISSUE WILL BE A SPECIAL NUMBER SOLELY DEVOTED TO PAPERS PRESENTED AT THE DECEMBER MEETING IN HOT SPRINGS, VA.

J. B. LIPPINCOTT COMPANY
EAST WASHINGTON SQUARE
PHILADELPHIA, PENNA.

VISIT THE C. V. MOSBY BOOTH

AT THE KANSAS CITY MEETING OF THE A.M.A.—MAY 11-15

NEW BOOKS

The C. V. Mosby Company invites the medical profession of America attending the Kansas City meeting of the American Medical Association convention, May 11-15, to visit Booth No. 7. Make the Mosby booth your headquarters. Arrange to meet your friends and associates there. The complete Mosby line will be on display for your inspection. You will not be importuned to buy.

NEW BOOKS

Allergy of the Nose and Paranasal Sinuses

By French K. Hansel, M.D., M.S., Assistant Professor of Clinical Otolaryngology, Washington University School of Medicine. 532 pages, 58 illustrations—3 color plates. Price, $10.00.

This book deals not only with the allergic phases of nasal and paranasal sinus diseases, but also with the various factors concerned in sinus infections. There are included comprehensive chapters on the clinical features of allergy as related to the field of ophthalmology, gastro-enterology, pediatrics and internal medicine. Nowhere else can such a wide variety of coverage be found—or so ample a discussion of all these important manifestations and phases of allergy.

Abortion—Spontaneous and Induced

By Frederick J. Taussig, M.D., F.A.C.S., Professor of Clinical Obstetrics and Clinical Gynecology, Washington University School of Medicine, St. Louis. 525 pages, 146 illustrations. Price, $7.50.

It is the first complete discussion in any language of all medical aspects of abortion, including a chapter on abortion in animals. Diagnosis, prevention and treatment are analyzed in simple, clear summaries for the benefit of the practitioner. It gives the first complete summary of abortion laws in the United States that has yet been published.

Immunology

By Noble Pierce Sherwood, Ph.D., M.D., Professor of Bacteriology, University of Kansas. 550 pages, 26 illustrations. Price, $6.00.

Throughout the book standard technics are presented, analyzed and discussed. Specificity is emphasized because it plays such an important part in diagnostic tests and in passive and active immunization.

Diseases of Women

By H. S. Crossen and Robert J. Crossen, St. Louis. 8th Edition. 1,000 pages, 1,058 illustrations. Price, $10.00.

Incorporates all the important advances in the field of gynecology. Special attention has been given to the role that the endocrines play in gynecologic disturbances and pathological conditions. Every chapter has been critically gone over for the purpose of bringing its material in line with the latest information.

Diseases of the Skin

By R. L. Sutton and R. L. Sutton, Jr., Kansas City, Mo. 9th Edition. 1,433 pages, 1,310 illustrations. Price, $12.50.

Both a textbook and an atlas on skin diseases. Both a reference book and a clinical therapeutic guide. The new edition covers 33 new skin diseases. Well illustrated—dependable—this work is rated by the critics as one of the best available to the medical profession today.

Examination of the Patient and Symptomatic Diagnosis

By J. W. Murray, M.D. 1,224 pages, 274 illustrations. Price, $10.00.

This new book covers fully every phase of history taking, including the analysis for differential diagnosis of hundreds of symptoms. It tells the doctor exactly what to look for and how to interpret his findings. It gives him the gist of what he wishes to find quickly, and in the most helpful form. If Murray's method is rigidly and systematically pursued it will yield results in a form that will be of the greatest practical value to the examiner.

Medical Mycology

By Carroll William Dodge, Ph.D., Professor of Botany, Washington University; Mycologist, Missouri Botanical Gardens, St. Louis. 832 pages, 142 illustrations. Price, $10.00.

The only complete book in English on fungus diseases (mycoses) of man and other mammals, giving morphological and cultural characters of all fungi which have been reported pathogenic, accompanied by the most complete bibliography (over 5,000 titles) so far assembled. The treatment of ringworm, athlete's foot and related diseases is the most comprehensive summary of all phases of the subject which has yet appeared in English, not only regarding the organisms but also the pathology and therapeusis.

Books That Deserve a Place in Your Library

The two books described below are deserving of your special consideration. Both are unusually practical books. Both are by outstanding men. Both books have been particularly well reviewed. Truly, they deserve a place in your working library. Once added to your library you will find daily use for them.

METHODS OF TREATMENT

By Logan Clendening, M.D., Kansas City, Mo. 880 Pages—102 Illustrations—Price, $10.00.

This is primarily a comprehensive discussion, first of the many means of cure, as drugs, biologic therapy, exercise, heat, diet, cold, etc., and, second, a discussion of the treatment of specific diseases. In this discussion the whys, wherefores, and why nots are considered and weighed in a way that shows the wide, wise and trained experience and excellent judgment of the author.

Archives of Internal Medicine in reviewing Clendening says: "This book still remains the classic in the field of medical treatment. The lucid manner in which it is written and the fact that it includes every important field in medical therapeutics makes it a necessary addition to any medical library."

INFANT NUTRITION

By W. McKim Marriott, B.S., M.D., St. Louis, Mo. 431 Pages—27 Illustrations—Price, $4.50.

This book is not only a manual on feeding but represents an extremely successful correlation of the theoretical and practical aspects of infant nutrition in health and disease. The various phases of infant nutrition—the metabolism of protein, carbohydrate and other dietary units, human and cow's milk, the normal and abnormal infantile gastro-intestinal processes—are methodically and expertly treated.

The Journal of the American Medical Association in reviewing Marriott says: "It should be in every pediatrician's and general practitioner's library."

EASY PAYMENT PLAN

Mosby books are available to you on convenient monthly terms. These range as low as $3.00 a month. If your order totals $15.00 or less, monthly payments of $3.00 are recommended. On larger order divide by six to arrive at monthly payments. This plan permits you to get the books you need right away—and to pay for them in easy monthly payments as you use the books.

Diseases of the Thyroid Gland

By Dr. Arthur E. Hertzler, Professor of Surgery, University of Kansas. New 3rd Edition. 349 pages, 181 illustrations. $7.50.

Experience has tended to more and more radical operation culminating in complete thyroidectomies in certain selected cases. This new edition, by an acknowledged authority in the thyroid field, covers the subject thoroughly, giving all the new developments.

Surgery of a General Practice

By Dr. A. E. Hertzler, Halstead, Kan. 602 pages, 472 illustrations. $7.50.

A book that every general practitioner can use to advantage. Covers just the kind of surgery that the general practitioner can, and should do . . . and tells definitely in a step by step method how to do it.

Synopsis of Clinical Laboratory Methods

By W. E. Bray, B.A., M.D., Professor of Clinical Pathology, University of Virginia; Director of Clinical Laboratories, University of Virginia Hospital. 310 pages, 32 illustrations. 11 color plates. Price, $3.75.

The object of this synopsis is to bring together in a small volume for ready reference information and the most frequently used methods of laboratory diagnosis.

Theory and Practice of Psychiatry

By William S. Sadler, M.D., Chief Psychiatrist, The Chicago Institute of Research and Diagnosis. About 1,000 pages. Price, about $10.00. Soon to be released.

This volume has been written with the idea not only of appealing to the psychiatric specialist but also for the purpose of supplying a helpful background for the general practitioner and non-psychiatric specialist who are desirous of becoming efficient in this field. It will assist the medical profession in divesting mental hygiene of many of its psychiatric mysteries. The trend of the book is along the lines of the present-day genetic-dynamic concepts of psychiatry which have contributed so much to making human behavior, normal and abnormal, more understandable.

Synopsis of Diseases of the Heart and Arteries

By George Herrmann, M.D., Ph.D., Professor of Clinical Medicine, University of Texas. About 400 pages, 40 illustrations. Price, about $4.00.

This book is an attempt to give medical practitioners an indexed epitome of the essentials of cardiology. Interest in diseases of the heart and arteries is growing all the time. Exhaustive treatises are indispensable for reference work, but general practitioners do not have time to pore over large and ponderous texts. This synopsis meets the requirement for a condensed, yet practical guide.

Management of Fractures, Dislocations and Sprains

By J. A. Key, St. Louis, and H. E. Conwell, Fairfield, Ala. 1,165 pages, 1,185 illustrations. Price, $12.50.

Not just another fracture book, but a practical working guide for the general practitioner and surgeon that will make it possible to treat correctly more fracture cases than otherwise could be handled. First Aid, Open Reduction, Workmen's Compensation and Medico-Legal Aspects are emphasized.

THE C. V. MOSBY COMPANY,
3525 Pine Blvd., St. Louis, Mo.

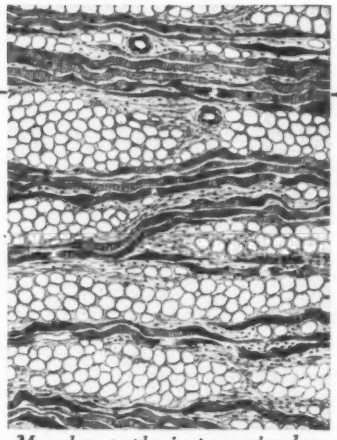
SMJ-5-36

Gentlemen: Send me the following books, charging my account .....

.....

Dr. ..... Address .....

GLYCINE of GELATINE in MUSCULAR DYSTROPHY



Muscular atrophy in progressive dystrophy. Note infiltration of fat and both swollen and shrunken muscle fibres: striation obliterated.

● Since 1932 observers have been reporting improvement in patients with muscular dystrophies who have been fed glycine daily over a period of weeks. Among the types of cases that have definitely been benefited are those of myasthenia gravis, pseudohypertrophic muscular dystrophy, and progressive muscular dystrophy. (1)

Benefits have ranged from arrest of the disease and the cessation of symptoms to improved muscle function and a return toward normal striations. For instance, one report by Boothby on 46 cases of myasthenia gravis states that all but two responded favorably. (2)

Knox Gelatine is 25% glycine. Its use as an adjuvant in glycine therapy is made widely available because it is so inexpensive. The recommended dosage of glycine is 10 to 15 grams daily. This amount is contained in 40 to 60 grams of Knox Gelatine which can be used in relatively concentrated form as high as 3½% in desserts and 10% and more in soups.

● A truly remarkable product, Knox Gelatine. Made as carefully as an ampule solution. Bacteriologically safe. Contains no sugar or flavoring. pH is nearly neutral. Exceeds in quality minimum U.S.P. standards.

See that your patients get a U.S.P. gelatine or better. None surpasses Knox Gelatine in purity. Send for booklet of recipes showing how gelatine may be used to make interesting glycine-rich dishes.

(1) Tripoli, McCord & Beard, J. A. M. A. Nov. 24, 1934.
(2) W. M. Boothby, Arch. Int. Med. 53, 39-45.

SPARKLING **KNOX** GELATINE

KNOX GELATINE LABORATORIES, 408 Knox Avenue, Johnstown, N.Y.
Please send me your new booklet "Glycine Therapy in Muscular Dystrophy and Myasthenia Gravis."

Name.....
Street and Number.....
City.....State.....

Making the First Formula Agree with the Baby

NEWBORNS require breast milk. Deprived of human milk, their nutritional requirements are met by simple mixtures of cow's milk, sugar and water. The milk may be fresh, evaporated, dried, sweet or sour; the sugar simple or mixed.

Whole milk formulas are suitable for most newborns with good digestive capacities. The amount of whole milk given should approximate ⅔ of the total required calories. And the remainder (one-third) should be in added Karo. Water is added to the mixture for the fluid intake to be about 2½ ounces per pound of baby weight per day.

Evaporated milk formulas are indicated for newborns with limited digestive capacities. They may be used to advantage in considerably higher concentrations than whole milk for premature, feeble and debilitated infants.

The added Karo is again one-third of the total required calories.

Dried milk formulas are suitable for allergic infants who will take only small volumes at a feeding and babies of allergic parents. Formulas approximately equivalent to whole milk may be made up with water and Karo added in the same ratio as in whole milk mixtures.

Acid milk formulas are of particular value for babies with low digestive capacities requiring large food requirements. Acid milk requires no dilution with water.

FORMULAS FOR THE NEWBORN

3 Ounces; 6 Feedings

Whole Milk	10 ounces
Boiled Milk	10 ounces
Karo	2 tablespoons
Evaporated Milk	6 ounces
Boiled Water	12 ounces
Karo	2 tablespoons
Powdered Milk	5 tablespoons
Boiled Water	20 ounces
Karo	2 tablespoons
Lactic Acid Milk	12 ounces
Boiled Water	8 ounces
Karo	2 tablespoons

REFERENCES:

Kugelmass, Clinical Nutrition in Infancy and Childhood, Lippincott.
Marriott, Infant Nutrition, Mosby.
McLean & Fales, Scientific Feeding in Infancy, Lea & Febiger.

The amount of Karo required may be added directly to the total volume of acid milk prescribed. Karo is an excellent milk modifier of dextrins, maltose and dextrose (with a small percentage of sucrose added for flavor) for both the baby and the budget.

Corn Products Consulting Service for Physicians is available for further clinical information regarding Karo. Please Address: Corn Products Sales Company, Dept. S5, 17 Battery Pl., New York City

Announcing

"SPECIAL" DRYCO

The only milk food fortified with vitamin B

THE addition of vitamin B to Dryco is not just another instance of climbing on the vitamin "band wagon."

It is based on a need definitely established in medical literature—the need for supplementing the infant dietary with vitamin B, particularly as an integral component of the formula milk.

"Special" Dryco is submitted to the medical profession only after 5 years of laboratory experiment by Borden, and 2 additional years of clinical study which *prove* its value.

First to increase vitamin D content, in 1929, Dryco pioneers again as the first and only milk food fortified with vitamin B today.

This new improved product is presented to the doctor as a significant contribution to infant welfare. "Special" Dryco will not replace the standard form of Dryco. Both are available at most drug stores.

ACCEPTED AMERICAN MEDICAL ASSN.

★ **Clip coupon for VITAMIN B BOOKLET**

For data on the need of supplementary vitamin B, plus description, clinical background and method of using "Special" Dryco, send for the booklet "VITAMIN B IN INFANCY."

THE BORDEN COMPANY, Dept. SM.J-56-D
350 Madison Avenue, New York City
Please send me the booklet "VITAMIN B IN INFANCY."
M. D.
Name
Address
State
City
Check here to receive samples of "Special" Dryco ( )

Readily ASSIMILABLE FAT -- an essential in FEEDING THE PREMATURE

IN a recent study of fat metabolism in infants, Holt, Tidwell and Kirk* report that olive oil showed the highest percent retention (95.1%) of all fats studied but one, olein (97.5%). These authors found the fat of SIMILAC (which is 20% olive oil) showed a better percent retention (92.6%) than butter fat (88.9%)—and as high a retention as breast milk fat (92.4%).

To quote these authors—"the differences in fat retention on these various fats as shown on normal infants are not great; for the normal infant it is probably immaterial whether he absorbs 85% or 95% of his fat intake. It seemed possible, however, that *in subjects who have difficulty in fat assimilation, such as premature infants, the observed small differences might become large differences. A few observations made on premature infants and twins have borne this out*—."

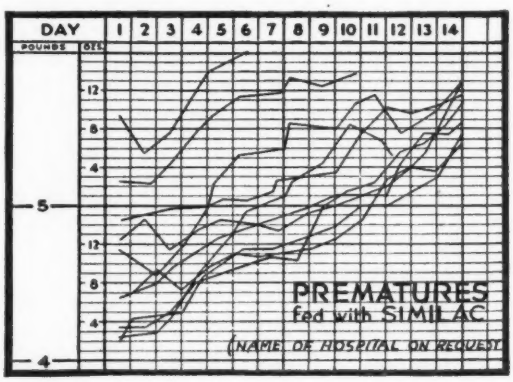
The observations referred to covered only three prematures fed on different fats, but showed an average of 78.4% retention for olive oil as compared to only 52.5% retention for butter fat.

*Holt, Tidwell and Kirk, Studies on Fat Metabolism in Infants—Acta Pediatrica, Vol. XVI, 1933.

SIMILAC

has given noticeably good results in feeding the premature infant. One of the reasons lies, as here pointed out, in the composition of its fat. Another reason is its consistently zero curd tension. The finer the curd the greater the surface area. The greater the surface area the more exposed are the fats, carbohydrates, proteins and salts to the digestive enzymes. Result . . . the food substances are more quickly and readily utilized.

SIMILAC is made from fresh skim milk (casein modified) with added lactose, salts, milk fat, and vegetable and cod liver oils.



The fact that SIMILAC is well assimilated by the immature digestive tract of the premature indicates how entirely suitable it is for all those infants who are deprived of breast milk.

M & R DIETETIC LABORATORIES, Inc., Columbus, Ohio

70 ways to get more calories

INTO A PATIENT'S DIET

WHEN a patient's diet calls for more calories, many physicians simply hand over a booklet called "Reinforced Diet Recipes with Klim."

This booklet contains 70 different recipes for staple dishes which provide 25% to 75% more food value—*with no increase in bulk or change in taste.*

And how the patient appreciates this wide variety of Klim-fortified dishes—in contrast to the monotony of highly-sweetened, "invalid drinks."

Because Klim is simply powdered whole milk, made more digestible by the drying process, it supplies extra food value in *more broadly nutritious, digestible form.* Klim fortified recipes are especially indicated in convalescence and anorexia, particularly in childhood.

Send for as many copies of the Klim recipe booklet as you need. It may be freely distributed to your patients—since it contains no reading matter that is contrary to professional ethics.

KLIM

The Borden Company
Dept. SM-1564 350 Madison Avenue, New York City

Please send me copies of the booklet "Reinforced Diet Recipes with Klim."

_____ M.D.

Street _____

City _____ State _____

ELI LILLY AND COMPANY

FOUNDED 1876

Makers of Medicinal Products

AMYTAL

(Iso-amyl Ethyl Barbituric Acid, Lilly)

Supplies the relaxation and sleep which are essential to rapid convalescence of medical and surgical patients. Upon awakening the head is clear; there is no after depression; energy and self-confidence are restored.

'Amytal' (Iso-amyl Ethyl Barbituric Acid, Lilly) is supplied in 1/8-grain, 1/4-grain, 3/4-grain, and 1 1/2-grain tablets in bottles of 40 and 500.

Prompt Attention Given to Professional Inquiries

PRINCIPAL OFFICES AND LABORATORIES, INDIANAPOLIS, INDIANA, U. S. A.

For the prevention and treatment of staphylococcic infections

STAPHYLOCOCCUS TOXOID

Lederle

STAPHYLOCOCCUS TOXOID has assumed an importance in the field of biologic therapy which merits recognition.

With its aid physicians are successfully treating recurrent and chronic staphylococcic infections which were formerly considered to be intractable.

Murray (Lancet, 1935,1,303) reports the following results of its use:

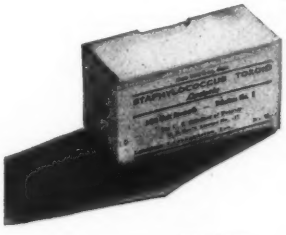
Condition Treated	Recovered	Improvement	Slight or No Benefit
Acne	3 cases	21 cases	6 cases
Blepharitis	8 "	6 "	1 "
Furunculosis	25 "	14 "	- "
Carbuncles	3 "	1 "	- "
Others	12 "	14 "	2 "
Total	51	56	9

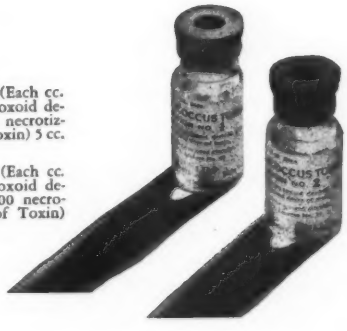
C. E. Dolman (Lancet, Feb. 9, 1935,306) reported successful results in 72 out of 81 cases of intractable staphylococcic infections with a series of injections of Staphylococcus Toxoid.

Each preparation of Staphylococcus Toxoid *Lederle* is tested for antigenic potency before release.

For complete information and literature, address:

LEDERLE LABORATORIES, INC.
30 ROCKEFELLER PLAZA NEW YORK, N. Y.

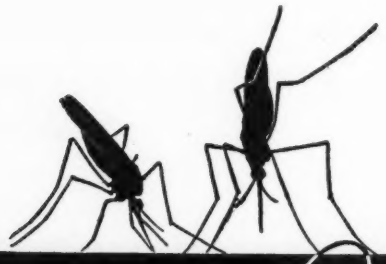




PACKAGES:

DILUTION 1 (Each cc. contains the toxoid derived from 100 necrotizing doses of Toxin) 5 cc. vial.

DILUTION 2 (Each cc. contains the toxoid derived from 1000 necrotizing doses of Toxin) 5 cc. vial.



Short treatment... Quick cure

in

MALARIA

The 5-day treatment of malaria with Atabrine not only promptly relieves all symptoms but also assures eradication of the parasites so that a cure results more rapidly and more certainly than with any other antimalarial agent.

MINIMAL RELAPSE RATE

The revolution which Atabrine is creating is based on its remarkable property to prevent relapses. With a "short quinine" course —comparable to that mentioned in a League of Nations report—Barrowman recorded relapses in 90 per cent of 235 cases observed for six months. After treatment with Atabrine the rate was only 9 per cent in a series of 371 cases. When Atabrine was supplemented with Plasmochin, relapses were further reduced to 3.5 per cent in 255 additional cases.

SUPERIOR ALSO IN ESTIVO-AUTUMNAL MALARIA

Estivo-autumnal malaria is more widely prevalent in the Southern States than is commonly believed. "The opinion that Atabrine is superior to quinine for the cure of primary attacks of malignant tertian (estivo-autumnal) malaria rests upon a large number of reports relating to natural cases."—League of Nations Report.

COMFORTABLE TO PATIENTS

Atabrine does not produce vertigo, tinnitus and headache. Furthermore, it can be safely employed in pregnancy and blackwater fever.

SIMPLE DOSAGE

Adults, one tablet three times daily. Children, proportionately less. Supplied in tablets of 0.1 Gm. (1½ grains), with groove for division, in tubes of 15 and bottles of 500.

Detailed literature on request.

ATABRINE

Reg. U. S. Pat. Off. & Canada
Brand of CHINACRIN

Motion picture "Malaria" loaned free to medical societies, hospitals, medical colleges, etc. Write for information.

Five-Day Treatment of Malaria

WINTHROP CHEMICAL COMPANY, INC.
170 VARICK STREET NEW YORK, N. Y.
Factories: Rensselaer, N. Y. - Windsor, Ont.

WINTHROP

Pharmaceuticals of merit for the physician

400M

SERENIUM

restrains the growth of bacteria in genito-urinary infections..

When orally administered in therapeutic doses, Serenium exerts a marked bacteriostatic effect on the micro-organisms present in the urine. In pyelitis and cystitis the symptoms and clinical findings are often improved by a brief course of treatment. It often gives excellent results in juvenile cases. In gonorrhea, Serenium is soothing to a degree which diminishes the burning, frequency and tenesmus.

Serenium is a distinct chemical compound, an organic dye, the hydrochloride of 2-4 diamino 4′ ethoxy-azobenzene. While bacteriostatically effective, it is so free from toxic effects that it can practically be considered innocuous. Serenium imparts a reddish orange color to acid urines, a fact which often inspires confidence in the patient that a cure is being effected.

Serenium is supplied exclusively by E. R. Squibb & Sons in bottles of 25, 50 and 500 chocolate-coated tablets of 0.1 gram each. The usual dose is one tablet three times a day after meals.

For literature write the Professional Service Dept., 745 Fifth Avenue

E·R·SQUIBB & SONS, NEW YORK

MANUFACTURING CHEMISTS TO THE MEDICAL PROFESSION SINCE 1858.

CAPROKOL PILLS

[*Pilulae Caprokol (Hexylresorcinol, S & D) 0.2 Gm.*]

. . . a new anthelmintic, effective against both Ascaris and hookworm

CAPROKOL PILLS have been marketed by Sharp & Dohme under the title of Hexylresorcinol Crystoids. Through extensive animal experimentation and quantitative studies in several thousand human cases, they have definitely established their value as an unusually *safe* and *effective* anthelmintic.

Caprokol Pills are effective in about 90% of hookworm cases and 95% to 100% of Ascaris cases. They have also proved effective against pinworm and whipworm infestations.

Caprokol Pills kill the parasites outright and thus avoid the danger of migration of the ascarids, which has sometimes resulted in complications such as intestinal obstruction, suffocation, etc., following the use of some drugs commonly employed. This is especially true in cases of mixed infestations of both Ascaris and hookworm.

* * *

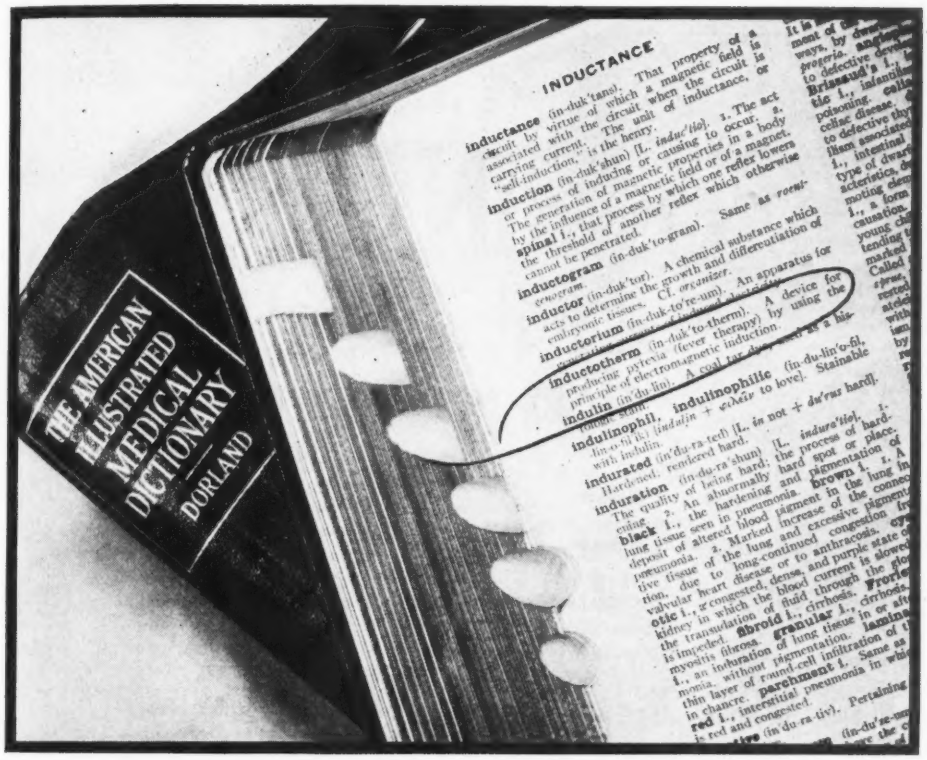
Supplied in single-vial packages containing five Caprokol Pills, each pill containing 0.2 Gm. Caprokol (Hexylresorcinol, S & D); also packages containing six single vials of five Caprokol Pills each. Further information supplied on request.

"For the Conservation of Life"

SHARP & DOHME

Pharmaceuticals—Biologicals

PHILADELPHIA BALTIMORE



The American Illustrated Medical Dictionary — Dorland. Published by W. B. Saunders Company, Philadelphia, Pa.

Established!

SELDOM has such widespread recognition been given to newly developed apparatus as to the G-E Inductotherm.

Indubitably this is because of the effectiveness of the basic principle — electromagnetic induction—in heating of the deep tissues. The efficacy of the equipment has been adequately demonstrated and the word "Inductotherm" has been added to the lexicon of science as representative of a powerful weapon placed in the armamentarium of medicine.

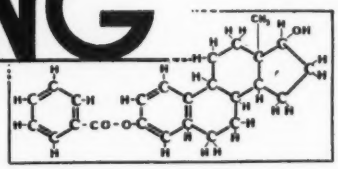
Certainly you are interested in learning how Inductothermy and Inductopyrexia may be employed in *your* practice. We suggest that you see the G-E Inductotherm in action, and invite your request for a demonstration to be given at your convenience, without involving obligation, in your office.

Write to Department A35

GENERAL ELECTRIC X-RAY CORPORATION

2012 JACKSON BOULEVARD CHICAGO, ILLINOIS

1st SCHERING



IN SEX HORMONE THERAPY

1st The Schering laboratories were the first to perfect the highly potent and effective dihydro form of the follicular hormone—*Progynon-B*,* the benzoic acid ester of dihydro follicular hormone. Extensive published reports by eminent workers reveal the efficacy of this material in the treatment of cases of follicular hormone deficiencies of the menopause, amenorrheas, dysmenorrhea, migraine, and gonorrheal vaginitis in children.

1st Schering was the first to synthesize and standardize the corpus luteum hormone. *Proluton** has shown itself to be singularly effective in the treatment of threatened and habitual abortion, metrorrhagia, and menorrhagia.

Greatly *reduced prices* place this valuable therapy within reach of more of your patients. The variety of concentrations make possible proper adjustment of dosage to the individual case.

Interesting literature on Progynon-B and Proluton sent on request

PHYSICIANS' PRICES

Progynon-B (in a Solution of Oil)		*Proluton* (in a Solution of Oil)	
500 Rat* U. (2,500 Int. U.) 6 Amps.	$1.40	1/25 Int. U. 5 Amps. . .	$2.40
1,000 Rat* U. (5,000 Int. U.) 6 Amps.	2.40	1/5 Int. U. 4 Amps. . .	3.20
2,000 Rat* U. (10,000 Int. U.) 3 Amps.	2.40	1/2 Int. U. 4 Amps. . .	4.00
2,000 Rat* U. (10,000 Int. U.) 6 Amps.	4.00	1 Int. U. 4 Amps. . .	5.60

*Allen-Doisy Standardization

Information on higher concentrations on request

© 1936 S. C. Blfd. N. J. *Reg. U. S. Pat. Off.

SCHERING CORPORATION
BLOOMFIELD • NEW JERSEY

St. Elizabeth's Hospital

RICHMOND, VIRGINIA

The operating rooms and all front bedrooms are completely air-conditioned. The air coming into these rooms is filtered, and a comfortable temperature is maintained.

School for Nurses

The Training School is affiliated with Johns Hopkins Hospital in Baltimore for a three months' course each in Pediatrics and Obstetrics. All applicants must be graduates of a high school or have the equivalent education. Address: Director of Nursing Education.

THE TUCKER SANATORIUM, INC.

212 West Franklin St. (Corner of Madison)

RICHMOND, VIRGINIA

This is the private Sanatorium for the Neurological Practice of Drs. Beverley R. Tucker, Howard R. Masters and James Asa Shield.

The Tucker Sanatorium is for the treatment of nervous and endocrine diseases. There are departments of massage, medicinal exercises, hydrotherapy and physiotherapy. The Sanatorium is large and bright, surrounded by a lawn and shady walks, large verandas and has a roof garden. It is situated in the best part of Richmond and is thoroughly and modernly equipped. The nurses are specially trained in the care of nervous cases.

Insane and acute alcoholic cases are not taken.

APPALACHIAN HALL

ASHEVILLE, NORTH CAROLINA

● **An institution for rest, convalescence, the diagnosis and treatment of nervous and mental disorders, alcohol and drug habituation.**

APPALACHIAN HALL is located in Asheville, North Carolina. Asheville justly claims an unexcelled all year round climate for health and comfort. All natural curative agents are used, such as physiotherapy, occupational therapy, outdoor sports, horseback riding, etc. Five beautiful golf courses are available to patients. Indoor sports consist of billiards, pool, ping-pong, gymnastic exercises. Two dances are given each week in the spacious ballroom, the other evenings are occupied with games and other entertainments.

Ample facilities for classification of patients. Rooms single or en suite with every comfort and convenience.

For rates and further information write Appalachian Hall.

WM. RAY GRIFFIN, M.D.
M. A. GRIFFIN, M.D.

Alcoholism
Senility
Drug Addiction

A Modern Ethical Hospital at Louisville

Founded 1904

Mental
and
Nervous Diseases

BEAUTIFUL AND SPACIOUS GROUNDS AFFORD OUTDOOR RELAXATION

Our **ALCOHOLIC** treatment destroys the craving, restores the appetite and sleep, and rebuilds the physical and nervous condition of the patient. Whiskey withdrawn gradually; no limit on the amount necessary to prevent or relieve delirium.

MENTAL patients have every comfort that their home affords.

The **DRUG** treatment is one of gradual Reduction; it relieves the constipation, restores the appetite and sleep; withdrawal pains are absent. No Hyoscine or rapid withdrawal methods used unless patient desires same.

NERVOUS patients are accepted by us for observation and diagnosis, as well as treatment.

Select cases of SENILITY accepted **Physiotherapy—Clinical Laboratory—X-Ray.** **Consulting Physicians.**

Rates
$25.00 Per Week and Up

THE STOKES HOSPITAL

Incorporated

Telephone,
Highland 2101

E. W. STOKES, M.D., Medical Director, 923 Cherokee Road, Louisville, Ky.

DR. MOODY'S SANITARIUM

SAN ANTONIO, TEXAS

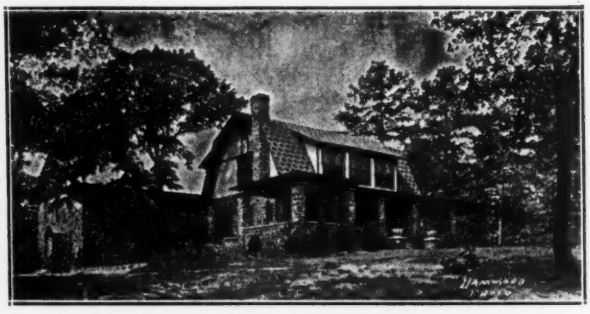
315 Brackenridge Avenue — Phone: Fannin 5522

For Nervous and Mental Diseases, Drug and Alcohol Addiction and Nervous Invalids Needing Rest and Recuperation

Established 1903. Strictly ethical. Location delightful summer and winter. Approved diagnostic and therapeutic methods. Seven buildings, each with separate lawns, each featuring a small separate sanitarium, affording wholesome restfulness and recreation, in doors and out doors, tactful nursing and homelike comforts.

G. H. MOODY, M.D.
Founder

J. A. McINTOSH, M.D., F.A.C.P.
Superintendent



Hoye's Sanitarium

"In the mountains of Meridian"

MERIDIAN, MISS.

For nervous and mental diseases, drug and alcohol addiction, rest and recuperation. Ten acres of beautiful grounds sufficiently removed from highway to insure privacy. All out-side rooms, connecting baths. Modern treatment.

Dr. M. J. L. Hoye, Supt.,
Formerly sixteen years Superintendent of East Mississippi State Hospital.

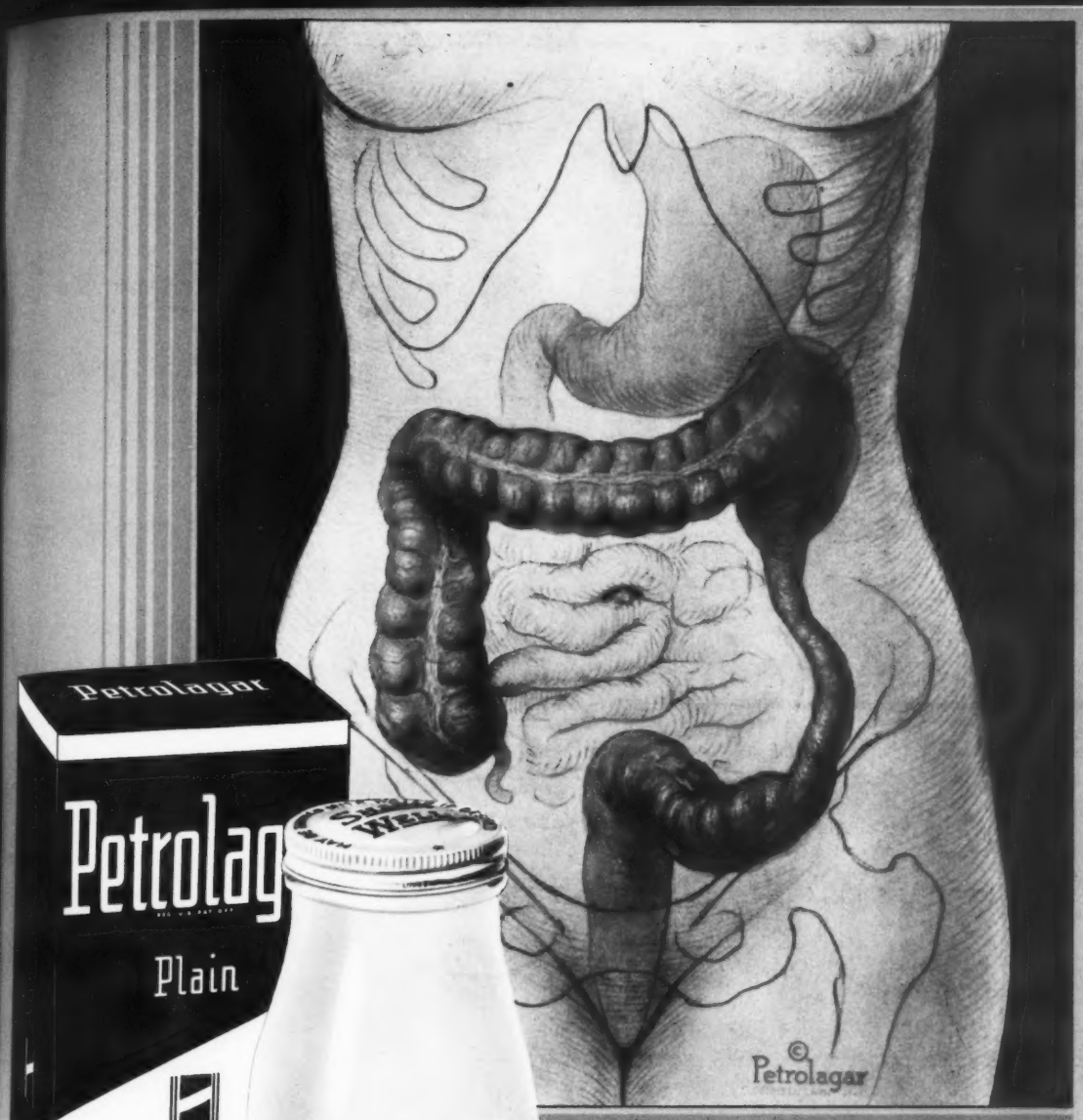
Saint Albans Sanatorium

RADFORD, VA.

Medical Staff

J. C. KING, M.D. JAMES KING, M.D.

A modern, ethical Institution, fully equipped for the diagnosis, care and treatment of medical neurological, mild mental and addiction cases. Ideal location, 2000 feet above sea level. Rates reasonable. Railway facilities excellent. Write for full details.



Especially Indicated in
SPASTIC CONSTIPATION

The high incidence of spastic constipation demands the use of a bland, non-irritating regimen, in both diet and medication.

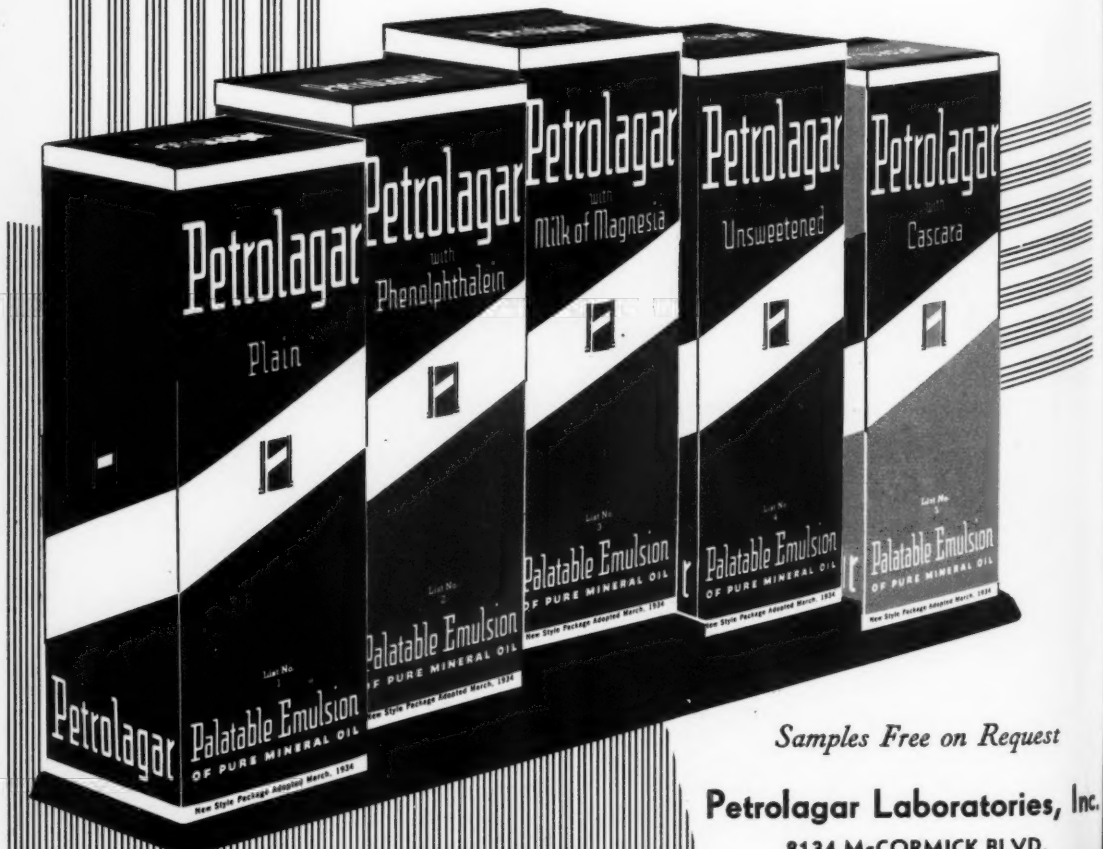
Petrolagar-Plain is not a cathartic. It mixes intimately with the bowel content and prevents the formation of hard masses.

5 TYPES of Petrolagar

All of which are Council-Accepted

To enable the physician to fit the treatment to the particular need of the patient, these five types afford a range of laxative potency which will meet practically every requirement of successful bowel management.

Petrolagar is 65 per cent (by volume) liquid petrolatum of most rigid specifications, emulsified with "Number One, Silver White, Kobe Agar-agar."



Samples Free on Request

Petrolagar Laboratories, Inc.

8134 McCORMICK BLVD.
CHICAGO, ILL.

McGUIRE CLINIC

ST. LUKE'S HOSPITAL

Richmond, Virginia

. . . Medical and Surgical Staff . . .

General Medicine:
James H. Smith, M.D.
Hunter H. McGuire, M.D.
Margaret Nolting, M.D.
John Powell Williams, M.D.
Kinloch Nelson, M.D.
Clifford H. Beach, M.D.

Orthopedic Surgery:
William T. Graham, M.D.
D. M. Faulkner, M.D.
J. T. Tucker, M.D.

General Surgery:
Stuart McGuire, M.D.
W. Lowndes Peple, M.D.
Carrington Williams, M.D.
W. P. Barnes, M.D.

Pathology and Radiology:
S. W. Budd, M.D.

Roentgenology:
J. L. Tabb, M.D.

Obstetrics:
H. Hudnall Ware, Jr., M.D.

Urology:
Austin I. Dodson, M.D.

Eye, Ear, Nose and Throat:
F. H. Lee, M.D.

Dental Surgery:
John Bell Williams, D.D.S.
Guy R. Harrison, D.D.S.

WALTER R. WALLACE, M.D. O. A. SCHMID, M.D. HUGH W. PRIDDY, M.D.

THE WALLACE SANITARIUM

MEMPHIS, TENN.

For the treatment of Drug Addiction, Alcoholism, Mental and Nervous Diseases. Fully equipped for the care of patients admitted. Sixteen acres of beautiful grounds. Located in the eastern suburbs of the city at Southern Avenue and Cherry Road.

WESTBROOK SANATORIUM

Richmond *Virginia*

TELEPHONE: 5-3245

Department for Men:
J. K. Hall, M.D.

Associates:
O. B. Darden, M.D.
E. H. Alderman, M.D.
E. H. Williams, M.D.

Department for Women:
P. V. Anderson, M.D.

The institution is situated just beyond the northern border of the city on United States Highway Number 1.

The scope of the work of the sanatorium is limited to the diagnosis and the treatment of nervous and mental disorders and to the addictions to drugs and to alcohol. It affords also adequate facilities for rest and upbuilding under medical and nursing supervision.

The medical staff devotes its entire attention to the patients in the Sanatorium.

The institution maintains a school for trained attendants in which instruction in the care of the nervous and mentally sick is emphasized.

There are twelve separate buildings for patients, with 150 beds. Such a large group of buildings makes possible the more congenial grouping of patients. Rooms may be had single or en suite, with or without private bath. There are a few small cottages for the use of individual patients.

A comprehensive general physical and nervous examination is made of each patient. A mental examination is made when indicated. The examination is typed and a copy of it is available for the referring physician. Complete dental investigation is a part of the general survey.

A skilled teacher gives practical daily instruction to small groups in the arts and crafts. Helpful and interesting occupation in the out-of-doors is made possible for the men patients in the vegetable and flower gardens, on the truck farm, in the poultry yards, and in the dairy.

There are bowling, tennis, croquet and pool. On Sunday evening there is chapel service.

Detailed information is available for physicians.

Dr. Brawner's Sanitarium

SMYRNA, GEORGIA
(Suburb of Atlanta)

● *For Nervous and Mental Disorders, Drug and Alcohol Addictions*

Approved diagnostic and therapeutic methods. Hydrotherapy, Electrotherapy, Massage, X-ray and Laboratory.

Special Department for General Invalids and Senile Cases at Monthly Rates.

JAMES N. BRAWNER, M.D., Medical Sup't.
ALBERT F. BRAWNER, M.D., Resident Sup't.

Grace Lutheran Sanatorium
FOR TUBERCULOSIS

SAN ANTONIO, TEXAS

ADMITS patients irrespective of religion or creed. An attractive institution in beautiful San Antonio. Climate unexcelled the year round for treatment of tuberculosis. Private rooms with bath and sleeping porch; individual cottages; high-class accommodations; Radiographic and Fluoroscopic service. Every room and cottage equipped with radio.

MODERATE RATES

For booklet and information address

REV. PAUL F. HEIN, D. D., Superintendent
P. O. Box 214 San Antonio, Texas

STUART CIRCLE HOSPITAL

Richmond, Va.

Medicine:
OSBOURNE O. ASHWORTH, M.D.
ALEXANDER G. BROWN, JR., M.D.
MANFRED CALL, M.D.
MANFRED CALL, III, M.D.

Ophthalmology, Otolaryngology:
CLIFTON M. MILLER, M.D.
R. H. WRIGHT, M.D.
W. L. MASON, M.D.

Roentgenology and Radiology:
FRED M. HODGES, M.D.
L. O. SNEAD, M.D.

Physiotherapy:
ELSA LANGE, B.S.
Technician

Medical Illustrator:
DOROTHY BOOTH

Surgery:
ROBERT C. BRYAN, M.D.
STUART N. MICHAUX, M.D.
CHARLES R. ROBINS, M.D.
A. STEPHENS GRAHAM, M.D.
CHARLES R. ROBINS, JR., M.D.

Obstetrics:
GREER BAUGHMAN, M.D.
BEN H. GRAY, M.D.
WM. DURWOOD SUGGS, M.D.

Urological Surgery:
JOSEPH F. GEISINGER, M.D.

Pathology:
REGENA BECK, M.D.

Oral Surgery:
GUY R. HARRISON, D.D.S.

Stuart Circle Hospital has been operated twenty-two years, affording scientific care to patients in General Medicine, Surgery, Obstetrics and the various medical and surgical specialties. Detailed information furnished physicians.

CHARLOTTE PFEIFFER, R.N., Superintendent

CITY VIEW SANITARIUM

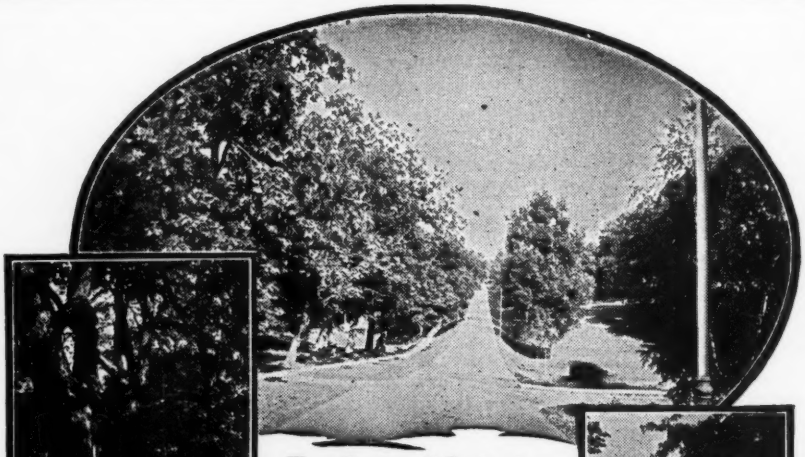
For MENTAL and NERVOUS DISEASES and ADDICTIONS

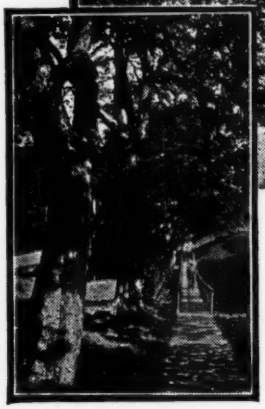
ESTABLISHED IN 1907
AN ENTIRELY NEW PLANT ERECTED IN 1922

Separate buildings for men and women, ideally arranged and equipped with every facility for the comfort, care and treatment of the class of patients received. Situated in the midst of a fifty-acre tract, and surrounded by large groves and attractive lawns. Two resident physicians. Training school for nurses.

References: The Medical Profession of Nashville

JOHN W. STEVENS, M.D., Physician-in-Charge
NASHVILLE R. F. D. No. 1 TENNESSEE
On Murfreesboro Pike, one-half mile east of old location





The Cincinnati Sanitarium
Inc. 1873

For Mental and Nervous Diseases

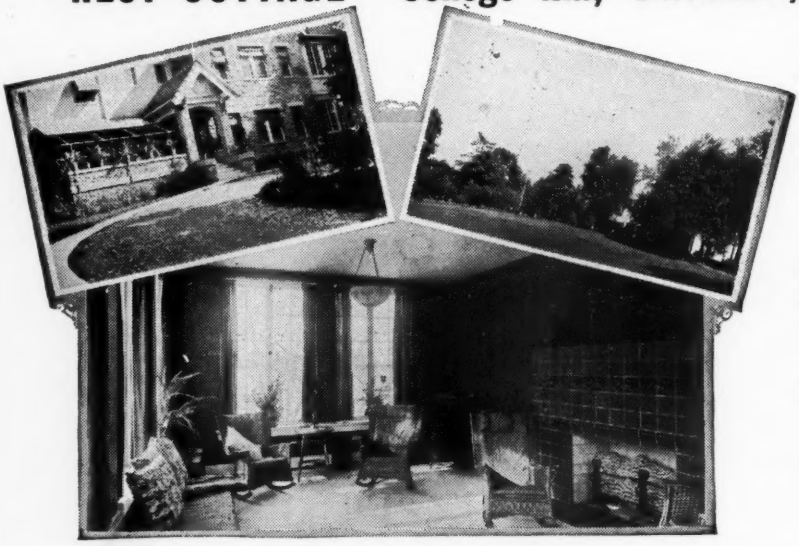
A strictly modern hospital fully equipped for the scientific treatment of nervous and mental affections. Situation retired and accessible. For details write for descriptive pamphlet.

Emerson A. North, M.D.,
Charles Kiely, M.D.,
Visiting Consultants

D. A. Johnston, M.D.,
Medical Director

H. P. COLLINS, Business Manager
Box No. 4, College Hill
CINCINNATI, OHIO

"REST COTTAGE" College Hill, Cincinnati, Ohio



For purely nervous cases, nutritional errors and convalescents.

Completely equipped for hydrotherapy, massages, etc.

Cuisine to meet individual needs.

Emerson A. North, M.D.
Charles Kiely, M. D.
Visiting Consultants

D. A. Johnston, M.D., Medical Director

H. P. Collins, Bus. Mgr., Box No. 4, College Hill, Cincinnati, Ohio

HILL CREST SANITARIUM

FOR NERVOUS AND MENTAL DISEASES AND ADDICTIONS

Established in 1925

A NEW PLANT WAS COMPLETED IN 1930

Thoroughly modern in architecture and construction. Eight departments—affording proper classification of patients. All outside rooms, attractively furnished. Several bathrooms and rooms with private bath on each floor. Also a spacious sun parlor in each department. Located on the crest of Higdon Hill, 1050 feet above sea level, overlooking the city, and surrounded by an expanse of beautiful woodland. Ample provision made for diversion and helpful occupation. Adequate night and day nursing service maintained.

JAMES A. BECTON, M.D., Physician-in-Charge

P. O. Box 96, Woodlawn Station, Birmingham, Ala. Phones: 9-1151 and 9-1152

Consultants: C. M. Rudulph, M.D.; H. S. Ward, M.D.; W. S. Littlejohn, M.D.

WAUKESHA SPRINGS SANITARIUM

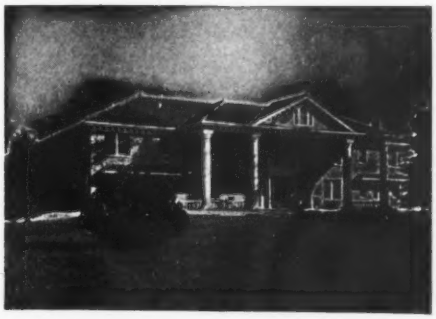
For the Care and Treatment of

NERVOUS DISEASES

Building Absolutely Fireproof

BYRON M. CAPLES, M.D., Medical Director
FLOYD W. APLIN, M.D.

Waukesha, - - - - Wisconsin



THE OXFORD RETREAT

Oxford, Ohio

FOR—

NERVOUS
AND
MILD MENTAL CASES

R. HARVEY COOK
Physician in Chief
Write for Descriptive Circular

Behind MERCUROCHROME

(dibrom-oxymercuri-fluorescein-sodium)

is a background of

Precise manufacturing methods insuring uniformity

Controlled laboratory investigation

Chemical and biological control of each lot produced

Extensive clinical application

Thirteen years' acceptance by the Council of Pharmacy and Chemistry of the American Medical Association

A booklet summarizing the important reports on Mercurochrome and describing its various uses will be sent to physicians on request.

HYNSON, WESTCOTT & DUNNING, Inc., Baltimore, Md.

ACID RESISTANCE WITH KALAK

Hypertonic — Alkaline — Carbonated — Not Laxative

The years of experience with physicians who have used Kalak show that the use of a formula containing calcium, magnesium, sodium and potassium salts represents a correctly balanced solution. This is Kalak which, as such, aids in maintaining a balanced base reserve.

How Alkaline Is Kalak?

One liter of Kalak requires more than 700 cc. N/10 HCl for neutralization of bases present as bicarbonates. Kalak is capable of neutralizing approximately three-quarters its volume of decinormal hydrochloric acid.

KALAK WATER CO. OF NEW YORK, Inc.

6 CHURCH STREET NEW YORK CITY

Kalak

SOUTHERN MEDICAL JOURNAL

JOURNAL OF THE SOUTHERN MEDICAL ASSOCIATION

PUBLISHED MONTHLY BY THE SOUTHERN MEDICAL ASSOCIATION AT BIRMINGHAM, ALA.

Volume 29 MAY 1936 Number 5

READJUSTMENTS IN THE THORACIC CAGE AND ITS CONTENTS FOLLOWING TOTAL AND PARTIAL PNEUMONECTOMY*

By WILLIAM F. RIENHOFF, JR.
Baltimore, Maryland

(1) *Introduction.*—The ultimate fate of the empty space remaining in the thoracic cavity after total or partial pneumonectomy, as well as the final effects of the operative removal of a part or the whole of one lung upon the cardio-respiratory function of the individual, are subjects which have become of increasing interest in the last five years.

(2) *Problem.*—The object of this paper is to point out: (1) the compensatory changes occurring in the thoracic cage and its contents after total and partial pneumonectomy; and (2) the total absence of immediate or remote respiratory or circulatory embarrassment following these procedures.

(3) *Material.*—This study is based upon an analysis of 36 cases, in 10 of which a complete pneumonectomy was performed. In 24 of the remainder only a part of the lung was removed and, finally, in two a post traumatic atrophy of the left lung had occurred. Of the group in which complete pneumonectomy has been performed, in four the operation was done upon the right side† and in six upon the left.‡ In 2 cases the lung was removed for tuberculosis; in 7 for carcinoma; and in 1, the first case reported, for a benign tumor. In this group one patient succumbed to diffuse lobular pneumonia five days after the operation. Three later deaths occurred, one after six months from cerebral metastases, another after three months from tuberculosis of the remaining lung; and finally the third, six weeks after operation from pulmonary embolism. Except the patient who succumbed to tuberculosis, all died in the hospital and came to autopsy, thus providing an opportunity to study the interesting intrathoracic anatomical readjustments which could thus be compared with certain clinical findings as well as with a series of x-ray films taken at regular intervals until just before death. Of the remaining six patients who are alive it has been possible, because of their cooperation and because they lived not far away, to study their clinical course at frequent intervals. In the series of 24 cases of partial pneumonectomy there have been 20 recoveries and 4 deaths. Three of these patients succumbed on the fourth postoperative day to confluent bronchopneumonia of the contralateral side, while the fourth one died on the thirty-fifth postoperative day from a sudden dilatation of the heart, as he was sitting up in a chair preparatory to his discharge from the hospital. The condition was proven by the x-ray findings. Autopsies were secured in all cases except this fourth one. The remaining twenty patients of this group have been under constant surveillance since their discharge from the hospital. The two remaining patients were examples of what may be called traumatic atrophy of the left lung resulting from an injury in early childhood. These patients, now 35 and 29 years of age, had been examined at the Johns Hopkins Hospital 32 and 20 years after a crushing injury to the left side of the chest. As space does not permit the discussion of each individual case in detail, the compensatory changes in general of the entire group will be described, eventual individual variations being noted. A complete

*Read in Section on Surgery, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

†The original of this whole group was the one in which the first total removal of the right lung was performed and which was reported in the Proceedings of the Interstate Postgraduate Medical Assembly of North America in November, 1934. The patient was operated upon November 1, 1934.

‡The operative technic of total pneumonectomy was reported: (1) Bull. Johns Hopkins Hosp., **53**:390-393, 1933; and (2) again, with the report of two cases of total left pneumonectomy, J.A.M.A., **103**:1121-1129 (Oct. 13) 1934.

report will appear in a later publication in which each case will be individually and fully discussed.

The restitutional compensatory mechanism following total or partial removal of a lung is based essentially on three factors: (1) on the readjustment and adaptation of the thoracic cage and diaphragm on the side operated upon as well as on the side not operated upon; (2) on the compensatory dilatation of the remaining lung; and (3) on the production of a space-occupying fenestrated labyrinth of connective tissue which tends to fill the remaining dead space, if any remain when factors (1) and (2), after their maximal restorative efforts, have failed to bring about a complete obliteration of the remaining thoracic space. The mechanism of these three factors is described in their successive order.

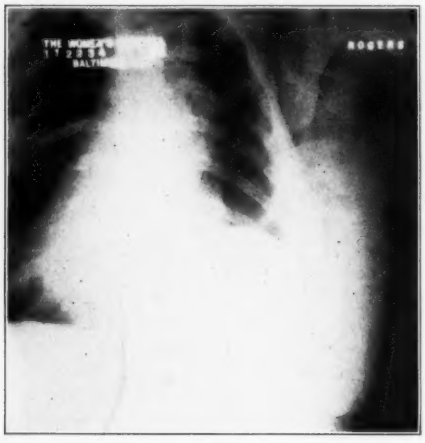


Fig. 1

X-ray of patient taken thirty minutes after removal of the entire right lung. Patient x-rayed on operating table after closure of chest. Shows marked shifting of the mediastinum to the right side and extreme elevation of diaphragm on the operative side. Five days after operation the dead space remaining was completely obliterated with plasma clot.

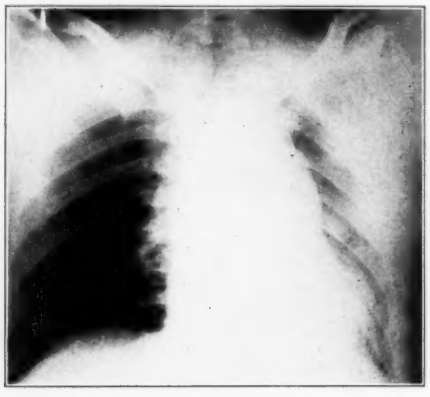


Fig. 2

X-ray of patient two hours after total left pneumonectomy. Attention is called to the extreme shifting of the mediastinum to the left side with elevation of the diaphragm. As in Fig. 1, shifting to the operative side must have resulted from immediate compensatory dilatation of the remaining lung.

(1) *The readjustment and adaptation of the thoracic cage and diaphragm on the side operated upon as well as on the side not operated upon.*

Immediately after operation for the total removal of the lung, there is a marked difference in the expansion of the thoracic cage on either side. This can be observed even while the patient is still on the operating table. There is practically no movement on the operative side except one that is transmitted; the ribs are obviously immobile and, as shown fluoroscopically, the diaphragm is much more elevated than normally. There is an immediate, marked shifting of the mediastinum towards the side operated upon, as shown in *Figs. 1* and *2*, which represent x-ray pictures taken thirty minutes and one hour after operation, respectively. It is extra-

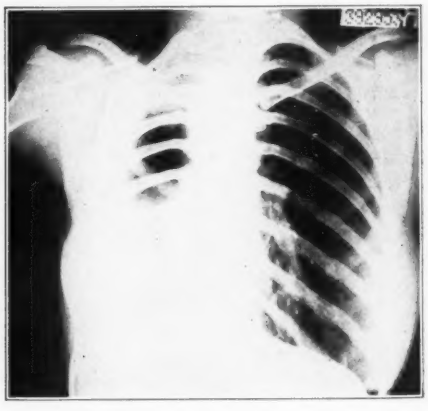


Fig. 3

X-ray of patient taken two years after total removal of the left lung. This shows extreme depression of the diaphragm on the side not operated upon with obliteration of the costophrenic sinus. Elevation of the dome of right apex with lowering of the left side. Approximation of the ribs on the left side and increased intercostal spaces on the right. The mediastinum is shifted over to the left end and the left diaphragm is markedly elevated. The right thoracic cavity is increased in the lateral as well as the antero-posterior and vertical diameters.

Fig. 4

X-ray of the chest of a patient two years and a half after total left pneumonectomy, following lipiodol injection. Compensatory increase in the size of the right thoracic cavity and dilatation of the right lung are evident. Injections of iodized oil are shown in the left thoracic cavity. The stump of the left primary bronchus is sharply defined. The trachea is deflected to the left. Left diaphragm is elevated. The hazy portion of the x-ray at the left base is due to heart displacement posteriorly.

ordinary how much shifting of the mediastinum can occur in a relatively short time. The size of the thoracic cage on the operative side shows a marked reduction, due to this shifting of the mediastinum as well as to the elevation of the diaphragm. The interspaces between the ribs are smaller on this side, and because of the compensatory dilatation of the remaining lung, which began within the first 24 hours, are wider on the normal side. This factor causes always, to a certain degree, an immediate scoliosis of the spine towards the operative side, which again serves to diminish the empty remaining space. The thoracic cavity on the operative side is reduced not only in the lateral diameter, but in all of them, particularly the anteroposterior. Furthermore, a disparity in the size and height of the apex or dome of the thoracic cage develops owing to disuse of the one side. After some days the separation of the ribs on the side not operated upon becomes more pronounced, while the reverse is true for the opposite side. The thoracic cage of the former is increased in all diameters. The diaphragm, owing to the compensatory dilatation of the remaining lung and the consequent increase in its volume, becomes permanently established at a much lower level than it normally occupies. The costophrenic sinus still exists, but it is much more obtuse or shallow than normal, and instead of being at about the level of the costal margin, the apex is very much more deepened and extends well down below into the peritoneal cavity. Thus the increase in volume of the lung and size of the chest occurs in all, the transverse, anteroposterior and vertical dimensions (*Fig. 3*). The acting forces are in marked contrast on the two sides. On the one side there is an elevation and immobilization of the diaphragm, a temporary scoliosis to the same side, a contraction of the intercostal spaces, a lowering of the dome of the thoracic cage, a shrinkage in the anteroposterior and lateral diameters with a shifting of the mediastinum toward the operative side. On the other side, the thorax is enlarged in just the opposite directions, that is, the dome of the thoracic cage is elevated, the intercostal spaces are wider, all diameters of the thoracic cage are increased, the diaphragm is deflected downward, the costophrenic sinuses are markedly enlarged in size, and the mediastinum is shifted away toward the opposite side. The readjustment of the thoracic parietes, that is, of the diaphragm and thoracic cage, following partial pneumonectomy differs only in degree from the above described changes which accompany complete ablation of a lung.

Fig. 5

X-ray with iodized oil injection of patient with post-traumatic atrophy of the left lung. There have been two identical cases from similar injuries proven by x-ray and operation. The right lung has passed entirely through the anterior and posterior mediastinum, practically filling the left chest. Iodized oil running in right bronchus may be seen in the extreme lateral left thoracic cavity. It could have been carried there only by the extension of the right lung.

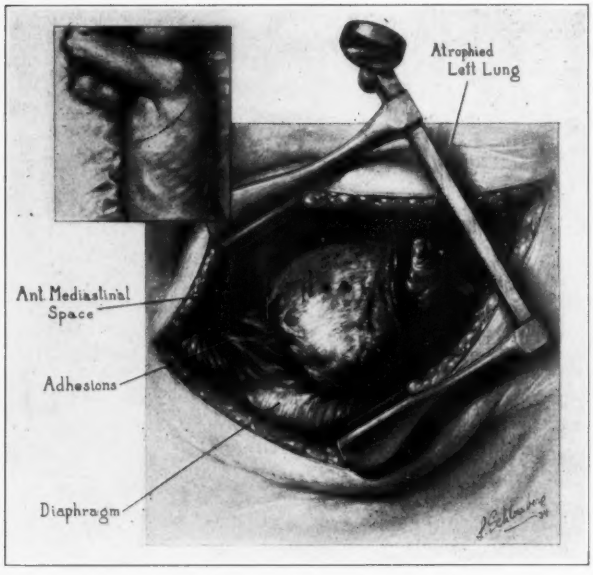


Fig. 6

Drawing made at operation on post-traumatic atrophy of the left lung for the release of extrapericardial adhesions. Posterior displacement of the heart is evident and the stump of the atrophied left lung. The distended line in the small insert shows the fifth interspace in which the incision was made. A special self-retaining retractor also is shown.

(2) *The compensatory dilatation of the remaining lung* begins immediately after operation, whether the latter is a partial or complete pneumonectomy. The difference in this factor of the compensatory restitutional mechanism is one of degree only, being of course greater after an entire removal than after a partial resection of the lung. The increase in volume of the remaining lung after a complete pneumonectomy manifests itself by an immediate exaggeration of the respiratory excursions of the side of the thorax which was not operated upon. Further, the objective evidence determined by x-ray films has just been described under the first factor of the compensatory mechanism. The constant increase in the measured vital capacity also bears witness to this compensatory dilatation. A final proof is found in the added anatomical and histological changes observed at autopsy.

There has been some difference in the degree of the compensatory dilatation in the nine surviving subjects of total pneumonectomy, but in all of them some hyperdistention of the remaining lung occurred. This difference in degree seemed not to depend on the age of the patient and appeared to be more pronounced after total left than after right pneumonectomies. Why this should be so is not clear from an anatomical point of view, unless it has to do with the rotation and displacement of the heart.

In the five cases of total left pneumonectomy for tumors of the lung and also in the two patients with traumatic atrophy of the left lung, there has been an enormous compensatory dilatation of the remaining right lung. In the first case operated upon and reported and in the traumatic cases the patients were small children aged three, three and a half and nine years, respectively, at the time of their operation and accidents. In these the restitutional compensatory dilatation was complete and the right lung almost entirely filled the left thoracic cavity by displacing the mediastinal contents to the left posterior portion of the thorax (*Figs. 4* and *5*). Even in these patients there is probably a very small dead space in the lateral portion of the left apex. However, in one of the other patients on whom a total left pneumonectomy was performed, an elderly woman 68 years of age, it was possible to observe the development of the compensatory mechanism from the clinical standpoint and later to compare those findings with direct observations made at autopsy, for death from metastases occurred six months after operation. Because of the age of this woman and the completeness of the restorative compensatory dilatation of the remaining right lung, together with anatomical proof of the clinical findings, this case may be described in detail as an example, showing that old age is no barrier to complete anatomical and physiological readjustment. The remaining four cases of total removal of the left lung have, with minor exceptions, presented the same clinical and x-ray evidence of compensatory readjustment and it is therefore likely that their anatomical changes are not dissimilar.

Further corroborating evidence of the compensatory readjustment following ablation of the entire left lung was observed at the operation upon two patients with traumatic atrophy of the left lung (*Figs. 6* and *7*). The clinical observa-

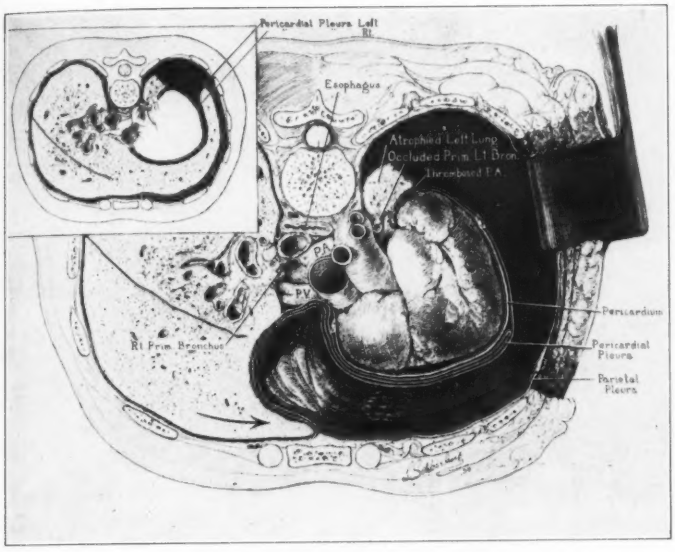


Fig. 7

Diagrammatic illustration of the manner in which the right lung filled the left chest in this case of post-traumatic atrophy of the left lung. A small insert in the upper right hand corner demonstrates the position of the lung when intratracheal pressure is up to 20 mm. of mercury. When this pressure was released and the chest opened, the atmospheric pressure in the lung retracted, leaving a large space not only in the left thoracic cavity, but also in the anterior mediastinum. The position of the heart in this case depended entirely upon the degree of inflation of the right lung. When it was distended under pressure the heart occupied a more posterior position than when the pressure was released, the heart probably swinging anteriorly and posteriorly with the respiratory excursion.

tions and operative findings corroborate in every respect the compensatory changes observed in the above mentioned operative cases. It would seem that the clinical and autopsy findings in the case of total left pneumonectomy in the patient 68 years of age, supplemented by the clinical observations on the five similar cases in patients who are still living, as well as the clinical and operative findings in the two cases of traumatic atrophy of the left lung, furnish sufficient data to formulate a fairly accurate picture of the intrathoracic readjustment following total left pneumonectomy. In such cases the remaining right lung undergoes in all three lobes a pronounced dilatation, so that the thoracic cage becomes enlarged in all diameters as above described. The upper lobe distends and protrudes into the lower cervical region through the superior opening of the thorax bounded by the first rib. The upper ribs seem to be elevated and show less of a downward slope. The medial surface of the upper lobe bulges toward the midline, displacing the lower end of the trachea to the left side. In all of these cases this tracheal displacement extended to the left parasternal line. Also the posteromedial surface of the upper lobe, as shown at autopsy, burrowed behind the trachea, pushing the parietal pleura in front of it and crossing the midline into the left pleural cavity through the posterior mediastinum in front of the bodies of the vertebrae, but behind the esophagus and trachea (*Fig. 8*). Below, this pseudopodia-like extension of the lung was interrupted by the azygous vein and bifurcation of the trachea. The anteromedial portion of the upper right lobe extended across the midline in the anterior mediastinum, entering and filling the upper anterior portion of the left thoracic cavity. The innominate artery and the veins define the upper limit of this protruding portion of the right upper lobe. The middle and lower right lobes also expand through both the posterior and anterior mediastinum (*Fig. 9*). The posteromedial portion of these lobes extended across the midline in the posterior mediastinum from the level of the bifurcation of the trachea to the diaphragm (*Fig. 8*). This lappet or tongue-like process of lung crossed the midline in front of the bodies of the thoracic vertebrae and the aorta, and was behind the esophagus. The extensions of the lung into the left posterior thoracic cavity measured about 6 cm. to the left of the midline. The entire mediastinum and its structures were shifted to the left of the midline and the space thus vacated was occupied by the bulging right lung. The heart was rotated into the lateral portion of the left vertebral gutter, to make room for the large lappet of lung arising from the anteromedial surfaces of the right middle and upper lobes, bulging through the anterior mediastinum to fill completely the anterolateral portion of the left thorax. The posteromedial portion above the heart, in an area that was in-

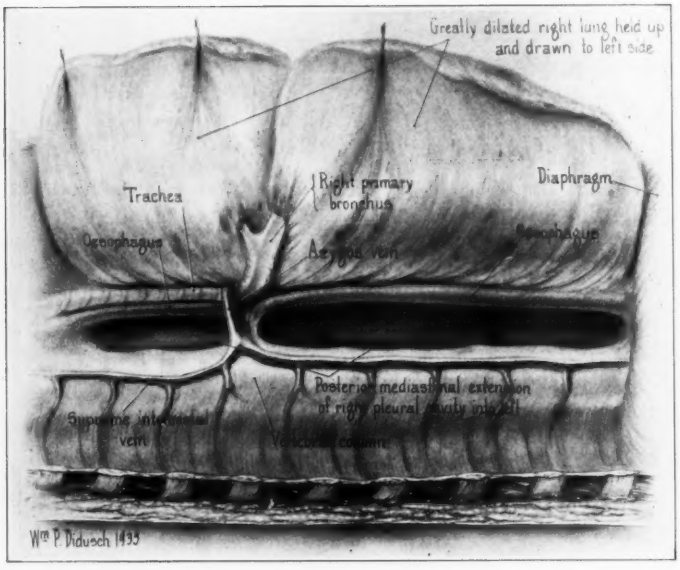


Fig. 8

Drawing made at autopsy of a patient who died six months after total left pneumonectomy. It shows enormous dilatation of the right lung. The shaded areas represent the burrowing of the posteromedial portion of the right upper, middle and inferior lobes through the posterior mediastinum above and below the azygos vein. This depression extended inward for a distance of about 6 cm.

completely filled with lung tissue in the 68-year-old patient had become occupied by a multilocular space-filling mass of fibrous tissue which was composed of many small cyst-like spaces filled with sterile clear fluid (*Fig. 10*). While the patient was alive and well these small spaces could be defined in the x-ray film.

Thoracotomy for the release of extrapericardial adhesions, performed on two patients with post traumatic atrophy of the left lung, corroborated in the living patients all that was observed in the above described case at autopsy. When the left thoracic cavity was opened, in both a large empty space was perceived in which the left lung was represented by a small fibrotic mass about 10 x 5 x 3 cm. in dimensions (*Fig. 6*). The left pulmonary artery had become obliterated and there had also occurred a complete obliteration of the left primary bronchus. The heart at that time was in an approximately normal position, but could be moved posteriorly with ease. By means of positive intratracheal pressure (20 mm. of mercury) the right lung could be filled to its capacity, and the crossing over from the right to the left thoracic cavity could in this way be directly observed in both the posterior and the anterior mediastinum. The lung actually passed across the midline in front of the thoracic vertebrae, below the bifurcation of the trachea, and in front of the aorta, bulging through the posterior mediastinum into the left thoracic cavity, and filling the vertebral gutter of that side. The thoracic aorta was not as fixed as usual, but had the appearance that might aptly be described as a mesentery with a definite elongation of the intercostal arteries. This mobility of the aorta was probably brought about by the shifting of the heart and therefore also of the aortic arch. In the anterior mediastinum, before the positive pressure was used, a very large defect could be seen into which both hands easily could be inserted for some distance to the right of the midline. With a positive pressure of 20 mm. of mercury a huge lappet of lung protruded across the midline, displacing the heart in the lateral and posterior directions with some rotation of the transverse arch. This bulging right lung would fill the entire left chest with the exception of the space occupied by the mediastinal structures and heart (*Fig. 7*).

These cases probably represent the ideal complete restitutional compensatory readjustment following destruction of the left lung, whether by operation or trauma, and demonstrate that these readjustments may take place without incapacitating the individual physiologically. The ages of patients in which the left lung was removed in the six operative cases were 3½, 21, 26, 30, 42 and 68, while those of the traumatic cases were 3 and 9 years. In all of them the compensatory readjustment has been similar with only minor exceptions, nor has it in any of them been necessary to perform a thoracoplasty. The subjects of the traumatic cases have lived for 32 and 20 years, respectively, without the least circulatory or respiratory disturbance

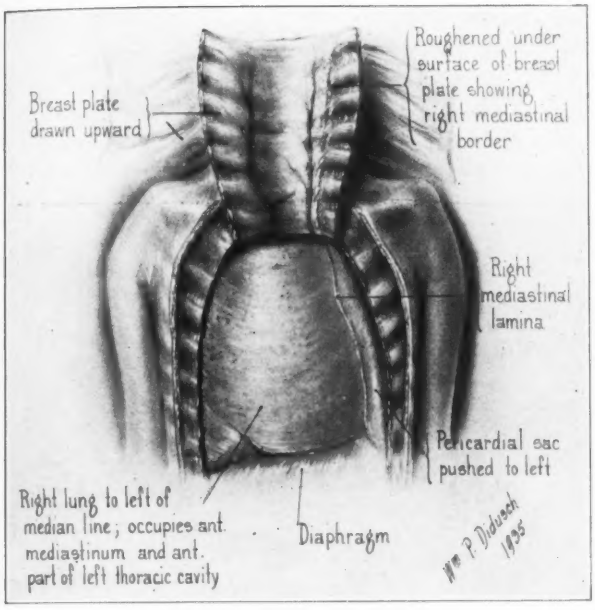

Roughened under surface of breast plate showing right mediastinal border
Breast plate drawn upward
Right mediastinal lamina
Pericardial sac pushed to left
Right lung to left of median line; occupies ant. mediastinum and ant. part of left thoracic cavity
Diaphragm
Wm P Didusch 1935

Fig. 9

Same patient, breast plate removed. This shows deflection of the mediastinal contents to the extreme left with upper and middle lobes of right lung bulging well over into the anterior mediastinum.

from distortion of the mediastinal vessels or structures. The patients operated upon and still alive also have been able to resume their normal active lives and have remained without any morbid symptoms. The period of time which has elapsed since their operations ranges from two and a half years to six months. In two of the operative cases there developed, after two weeks, very small but definite openings in the left primary bronchus; but while the period of intrathoracic adjustment for that reason seemed delayed, it was nevertheless finally accomplished without further resort to surgical measures.

It would seem, therefore, that the entire left lung may be removed with the assurance that the empty space ensuing will be filled, and that in the absence of generalized infection of the pleural cavity further thoracoplastic procedures will be unnecessary.

(3) *The formation of a space-occupying fenestrated labyrinth of connective tissue.* In the first two total left pneumonectomies reported, attention was called to the fact that the empty space resulting from the removal of the left lung was immediately filled with a sero-sanguineous exudate, composed in the main of plasma and some cellular elements, all of them derived from the blood stream. This seems indeed to be the modus operandi by which the body tends to obliterate dead or empty spaces created within its confines, whether the latter be caused by the surgical removal of a portion or by congenital absence. Many of the well-known cysts throughout the body, especially of the lung, might result therefrom. That in all of the operative cases this accumulation of plasma has occurred was proven by diagnostic thoracenteses of small amounts and repeated x-ray films.

After some hours coagulation of the main portion of this mass occurs, and from the entirely fluid medium fibrin is precipitated out which forms a fragile scaffolding, so to speak, in which there are many different-sized pockets containing serum. The fibrinous skeleton in time becomes organized by fibroblasts growing in from the chest wall, and finally, what at first was a homogeneous mass of fibrin becomes transformed into a multiloculated space enclosing honeycombed mass of fibrous tissue which contains, in turn, fluid in small labyrinth-like spaces. This mass, which may be very small or may occupy the entire thoracic cage, acts alone but efficiently as a filler of the space not occupied by the compensatory dilatation of the remaining lung tissue. Such formation of small multilocular spaces occurs also after partial pneumonectomy. Particularly is this true where an upper lobe has been removed; and when the chest is finally healed it is almost impossible to distinguish this sponge-like tissue mass from lung parenchyma (*Fig. 11*). In resections of the lower lobe, the remaining upper lobe at first drops down, but has in our series invariably re-expanded, filling last of all the apex of the thoracic cage. Eventually the one superior, right or left, lobe expands to occupy the entire remaining space. Quite different are the conditions following resections of the upper lobe. In them the resulting empty space is incompletely filled by the remaining lower lobes, so that the apical region of the thorax becomes

Fig. 10

Remaining space in the left chest which was obliterated by the multilocular space-occupying fibrous tissue body in the superior-posterior lateral portion of the left thoracic cavity. The heart and mediastinal contents are pushed over to the extreme left.

occupied by this multilocular mass of fibrous tissue instead of by lung parenchyma.

Of the four patients on whom complete right pneumonectomy was performed, two have died: one of pneumonia of the left lung five days following operation, and the other six weeks later of pulmonary embolism. Daily diagnostic thoracenteses and x-ray examinations before death showed that in both cases there was an accumulation of plasma within 24 hours after the operation, filling the entire right thoracic cavity. This plasma was, in these as in the other eight cases of total pneumonectomy, always sterile. As in the other cases, so it proved to be in these, that the daily aspirations of fluid became less easy and the fluid itself less in amount. The character of the aspirated contents has been always the same, that is, a serosanguineous fluid which will nearly always clot on standing in a glass tube. A smear of this fluid reveals a majority of red blood cells with some polymorphonuclears and small lymphocytes, the white cells being much less in proportion to their normal occurrence in the blood stream. The cellular elements will settle down to the lower portion of the thoracic cavity so that, with the patient in a semi-sitting posture, aspirations at higher levels reveal a clearer fluid. Air, some of which is always trapped within the chest cavity during and after closure of the wound, rises to the upper part of the cavity, where it is slowly absorbed. Owing to the fact that, when the patient is elevated into a half sitting position, the posterior-inferior portion of the thorax is filled with the plasma exudate, the entrapped air fills the superior anterior portion. After 48 to 72 hours this mass of fluid becomes coagulated and resembles in all respects ordinary blood clot. The deeper color is noticed in the bottom of the mass, where also the cellular elements accumulate. However, throughout cyst-like areas appear containing a serum that on smears proves free of all cellular elements. This is again an occurrence similar in all respects to the accumulation of serum formed around the blood clot in a test tube; it is the retraction of the clot that causes formation of the small cyst-like area. This fibrinous skeleton becomes organized with the usual contraction, thus causing an elevation and immobilization

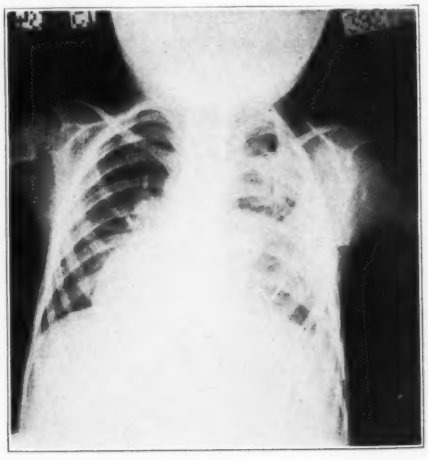


Fig. 11

X-ray of three-year-old child in whom the left upper lobe had been removed for infected congenital cyst. Multilocular space-occupying body of fibrous tissue has completely filled the superior portion of the left thoracic cavity previously occupied by left upper lobe.

Fig. 12

Large mass of fibrous tissue and fibrin containing many small cysts. This mass occupied the entire right thoracic cavity of the patient in whom a total right pneumonectomy had been performed six weeks previously. The patient succumbed to pulmonary embolism of the remaining left lung.

of the diaphragm as well as an immobilization of the chest wall, a retraction of the ribs and a diminution of the interspaces. In the two patients who died 5 and 42 days following a right total pneumonectomy, this organizing mass of coagulated material was observed in the gross and also microscopically (*Figs. 12* and *13*). *Figs. 12* and *14* show the photograph and drawing made at the time of the autopsy. In these 4 cases of right total pneumonectomy, although there was some shifting of the mediastinum, the major role in the obliteration of the remaining dead space was played by the formation of a fibrinous mass which, in the 42 day case, was beginning to undergo organization. It is likely that the remaining left lung, unlike the right, may not be able to cross the midline and fill the other side of the chest. This, again, may be due to the fact that the anatomical circumstances would prevent this change. For instance, as the left lung consists of only two lobes; the displacement and rotation of the heart to the left is mechanically easier of accomplishment than to the right. This emphasizes further that, although the remaining lung fails to fill the contralateral thoracic space after total pneumonectomy, the readjustment of the thoracic parietes, together with the formation of this multilocular mass, will cause the obliteration of that space. This is similar to the organization of a blood clot in the blood clot operation originally described by Schede. This obliteration renders collapse of the thoracic cage by thoracoplasty unnecessary. In the event of an infection the clot is completely or partially destroyed, and under these circumstances an obliteration of the remaining dead space is delayed or perhaps prevented, so that some form of thoracoplasty may have to be resorted to.

SUMMARY

Although this series of cases is relatively large, it is actually small, and to draw very definite conclusions from it would be incorrect; nevertheless, it is only fair to state that this experience so far teaches that thoracoplasty or the resection of ribs may be given up, certainly as a primary procedure, and that in all probability, particularly in clean cases, it will be unnecessary to perform any type of thoracoplastic operation. It would also seem that it is unneces-

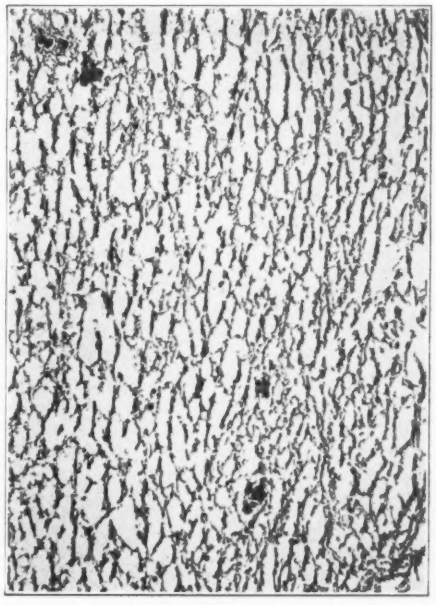


Fig. 13

Microscopic section of fibrinous mass shown in Fig. 12 reveals fibrinous tissue with occasional polymorphonuclear leukocytes.

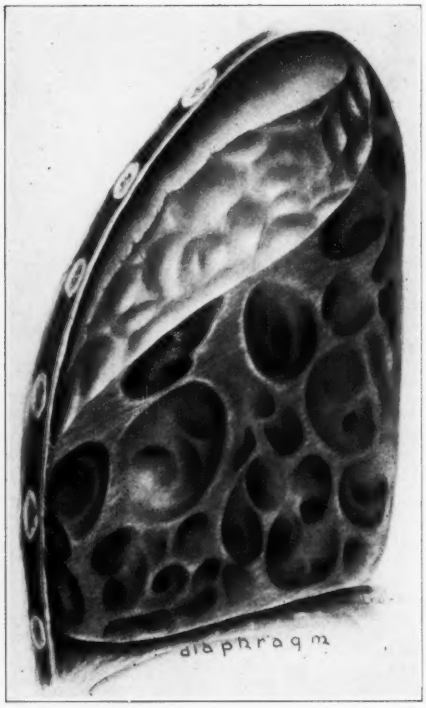


Fig. 14

Drawing made at autopsy of patient from whom fibrinous mass shown in Fig. 12 was removed. Cross section reveals cystic areas within. These cysts were probably formed by retraction of clot. Air space is shown in the anterior superior thoracic cavity. The latter is probably due to semi-sitting posture of the patient for the first few days after operation.

sary to do a phrenicectomy before or during the operation of total or partial pneumonectomy. For it is the piston action of the diaphragm on that side against the rigid intact wall of the thorax on both sides that brings about the so necessary expansion of the remaining lobes following partial pneumonectomy and it is, as a rule, either completely immobilized or practically so on the side operated upon for some time following total pneumonectomy. It would also seem probable that at a later date the activity of the diaphragm on the operative side returns with the filling of the thorax by the dilatation of the contralateral lung. Hence it follows that interference with the normal anatomical or physiological condition of the thoracic parietes after total or partial pneumonectomy, in our present state of knowledge, may be unnecessary, if not actually harmful.

It is of course advisable not to drain the remaining empty space following total pneumonectomy, because this is immediately filled, as shown, with a coagulated mass of plasma that undergoes later organization with the production of a fibrous tissue mass that occupies a space of greater or less size, depending on the cavity that eventually has to be filled. It is quite interesting that not only in total but also in partial pneumonectomy, if the remaining lung undergoes a compensatory dilatation, this multiloculated cystic mass of fibrous tissue is compressed by the encroaching lung or lobe and gives way as the space is occupied by the gradual enlargement of the remaining lung tissue, the final result being that the space which normally would be occupied by lung but is not becomes filled by this labyrinthian, cystic, fibrous-tissue body. As stated above, this may, as it is in cases of total right pneumonectomy be so great as to occupy the entire remaining thoracic cavity, or it may fill only a very small portion.

It should be stated that in the experimental studies recorded in the *Bulletin of the Johns Hopkins Hospital* for December, 1935, and also in the sections of the lung in the 68-year-old woman, there has been found no histological evidence whatsoever of emphysema of the remaining lung. Emphysema should be distinguished from compensatory dilatation, for in the latter there is no fragilation of the elastic tissue surrounding the definite respiratory unit consisting of the alveoli, air sacs, atria, and alveolar ducts. Emphysema is a pathological condition in which there is an interruption of the elastic tissue. There has been quite marked tracheal displacement in all of these cases, but it is to be noted that there has been no displacement or rotation of the heart to the right side similar to rotation noted to the left side. This may be impossible and, if it were, might well give rise to disturbance of the circulation, for, from a mechanical standpoint, rotation of the heart to the left and posteriorly would cause much less disturbance in the angulation or twisting of the aorta than would the same degree of displacement to the right side. We have been able to elicit no evidence whatsoever that compensatory dilatation of the lung, either in man or animal, is harmful. It is only necessary to point to our two cases of traumatic atrophy of the left lung of 20 and 32 years' duration, in which the remaining right lung has undergone a marked compensatory dilatation, to demonstrate the fact that complete posterior displace-

ment of the heart with a rotation of the mediastinal vessels to the left due to compensatory dilatation of the remaining right lung is not incompatible with at least three decades through vigorous youth, adolescence, and at present healthy, hard laboring adult life. To say what the longevity of these two patients would be is pure conjecture, but there is nothing to indicate that they will not survive to their normal expectancy. Their span of life will exceed, in all probability, the normal life expectancy of the average person operated upon for a tumor of the lung, for although these growths occur in young people, the great majority will be found between the fourth and sixth decade. The remaining life expectancy would therefore be between three and one decades. In any event, it would seem advisable to confine the primary operation to removal of the lung or parts thereof, leaving the need of further thoracoplastic procedure, not as a probability but as only a remote possibility for the future. The necessity for this type of secondary operation would be determined by the patient's convalescence and postoperative activities.

To recapitulate, it may be said that resection of the entire lung seems to be a feasible operation which has proven itself worthy of a place among the recognized technically safe surgical procedures. Experience, although to a certain extent limited, thus far would warrant the conclusion that patients will survive this operation and be restored to their normal activity in a measure which is comparable, not only in mortality but in the lack of postoperative incapacitation, to operations performed for the removal of malignant visceral tumors elsewhere in the body.

DISCUSSION (*Abstract*)

Dr. Evarts A. Graham, St. Louis, Mo.—I wish first of all to compliment Dr. Rienhoff for his splendid presentation of the mechanism by which the large pleural space remaining after the total removal of a lung can be obliterated. In regard to his contention that after the total removal of the lung it is unnecessary to remove any ribs to obliterate the empty space, I feel that he has unquestionably brought sufficient evidence to prove that at least it is not necessary to perform a thoracoplasty at the time of or soon after the removal of the lung. In my first case of total pneumonectomy I felt that it was desirable to perform a partial thoracoplasty at the same time in order to help obliterate the large empty space. Subsequent experience and Rienhoff's observations have convinced me that I was wrong and that he was right in the opinion that if a thoracoplasty should become necessary it could be performed at a later date. I do not feel, however, that at the present time one can state definitely that a thoracoplasty will never be necessary in such cases. Of course, Dr. Rienhoff does not make such a statement himself. It is a fairly common experience to find that patients with chronic fibroid tuberculosis sometimes suffer from disabling dyspnea because of the marked displacement of the trachea and the great vessels to one side. In such patients a thoracoplasty nearly always results in an amazing improvement in the dyspnea because it permits the trachea and great vessels to assume their normal positions. Recently also a negro boy was brought to me because of disabling dyspnea resulting from a marked displacement of his trachea and great vessels to one side, apparently as the result of a congenital failure of development of the lung on that side. A thoracoplasty resulted in a return of the trachea and great vessels to their normal positions and the dyspnea was correspondingly relieved to such an extent that he was able to play baseball and to engage in other athletic exercises like any normal boy. I should like to show some lantern slides dealing with this case.

Another point about which I still have some doubt concerns the question of whether or not it will be a good thing for the patient if one lung becomes so large that it almost equals the size of two lungs. I am not yet convinced that as the years go by such patients may not suffer from the effects of emphysema which may be serious in themselves. It is possible, therefore, that perhaps five or ten years from now all of us may feel that a partial or complete thoracoplasty should be performed in many of these cases, although not necessarily at the time of, or even soon after, the operation for the removal of the lung.

I have been very much interested and I may say amazed at the demonstration that Dr. Rienhoff has given us of the lack of necessity of draining off the fluid which tends to collect in the large empty space. In my early work in lobectomy and total pneumonectomy I felt that the retention of this fluid might encourage infection and that, therefore, it should be removed either by frequent aspiration or by continuous closed drainage. I have now, however, come around to agree with Dr. Rienhoff that it is probably better to allow the fluid to remain and to become organized.

We are greatly indebted to Dr. Rienhoff for contributions to our technic which will unquestionably make it safer to perform a total or partial removal of a lung.

Dr. I. A. Bigger, Richmond, Va.—The question of whether or not to collapse the chest wall following pneumonectomy will become more important as the number of such operations increases.

I should expect readjustment to take place readily following pneumonectomy in children and young adults, in whom the chest wall is more mobile and the lung more elastic than in older individuals. However, total pneumonectomy is most apt to be done for bronchial carcinoma, which occurs more frequently after middle

life. As Dr. Graham said, leaving the chest wall intact may result in interference with the circulation, by displacement of the mediastinal structures and torsion of the great vessels, as well as emphysema, from overdistention of the remaining lung. It would seem to me that the latter would be a greater danger than the former, since circulatory disturbances could be relieved by thoracoplasty, even though well developed, but advanced emphysema is irremediable.

Determination of the intrapleural pressure, on the sound side, in a group of cases such as Dr. Rienhoff has would be of interest. If the intrapleural pressure remained constant, it might be assumed that the elastic tissue in the lung was not giving way under the increased strain, but, if it approached atmospheric pressure, it would indicate that the elastic tissue was giving way, which would result in the development of emphysema if the chest wall were not collapsed. Such studies carried out over a period of years might give information of value not only in deciding the general question of whether or not to collapse the chest wall following pneumonectomy, but also in managing the individual patients under observation.

Dr. Rienhoff (closing).—Thoracoplasty may, in case of infection of the thoracic cavity, eventually be necessary in some few cases. However, this will have to be settled by future experience in dealing with these cases.

Dr. Graham's case of the colored boy is very interesting and it seems to me, from the x-rays, might be one of dextracardia, which is in reality a different situation from total removal of a lung.

In my cases, as I pointed out, the heart was not displaced in total pneumonectomy on the right side as it was towards the left, and it may not be possible for this displacement of the heart to the right side to take place. I think perhaps the fact that none of the postoperative cases has developed dyspnea or other signs of circulatory or respiratory disturbances, and that two cases, twenty and thirty years after traumatic atrophy of the left lung proved by operation, showed no physiological disturbance, are fairly good proof that dilatation of the lung over a period of years is not of itself deleterious to the health of the individual. So far as I know, there is no experimental or clinical data to suggest that a compensatory dilatation of the lung is harmful to the individual or predisposes to the pathological state of emphysema.

I should like to call Dr. Bigger's attention to the fact that one of the most complete compensatory readjustments we have had occurred in an older patient, 68 years of age, upon whom I had performed a total left pneumonectomy. Later when this patient came to autopsy from cerebral metastases six months after the operation, the sections of the remaining lung showed no signs of emphysema. After all, I feel that we must consider emphysema a pathological entity due to fragilation of elastic tissue; it has no relation whatsoever to compensatory dilatation of the definitive respiratory unit. It is possible of course that one may have emphysema in a normal lung or one that has undergone this dilatation, after a number of years, but to say that one will bring on the other cannot be proven at this time. Certainly all the evidence at the present time, both clinical and experimental, speaks against the development of emphysema from compensatory dilatation.

As for Dr. Bigger's statement that leaving the chest wall intact may result in intereference with the circulation by displacement of the mediastinal structures and torsion of the great vessels, there is also not the slightest evidence to support this in our series of cases. Of course it would be unwise to say that such a condition might not develop in some cases, for our series is far too small to allow us to come to such a conclusion; but from the clinical and experimental evidence present not only in the postoperative cases, but also in the congenital absence and post traumatic atrophy of the left lung cited in this paper, there is no evidence of circulatory insufficiency from torsion of the mediastinal vessels. It is very doubtful in my mind that this will ever occur because of the fact that in the instance of the removal of the left lung, the right lung expands through the anterior and posterior mediastinum, anterior to the heart and large vessels and more or less envelops them. They are not pushed laterally entirely, but they are also somewhat rotated, and I do not believe it would be possible with the force exerted by the dilatation of a lung to displace the heart and larger vessels to the extent that it would decrease their lumen. This is the only manner in which I can conceive that the circulation could be interfered with. As pointed out in this paper, the displacement of the heart to the right in our experience would not occur in any degree comparable to the displacement to the left.

RECOGNITION OF THE MODERN TREATMENT OF BROKEN HIPS*

By LAWSON THORNTON, M.D.
and
CALVIN SANDISON, M.D.
Atlanta, Georgia

Many of us have completely changed our thinking on the subject of treatment of a recent fracture of the neck of the femur. A departure from former procedures is rapidly taking place in favor of a method more humane and successful than any we have known in the past. It has been discovered that this fracture can be fastened together permanently with a Smith-Petersen nail and without the requirement of a plaster cast or any external support; and can be applied to people of any age, even the

*Read in Section on Bone and Joint Surgery, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

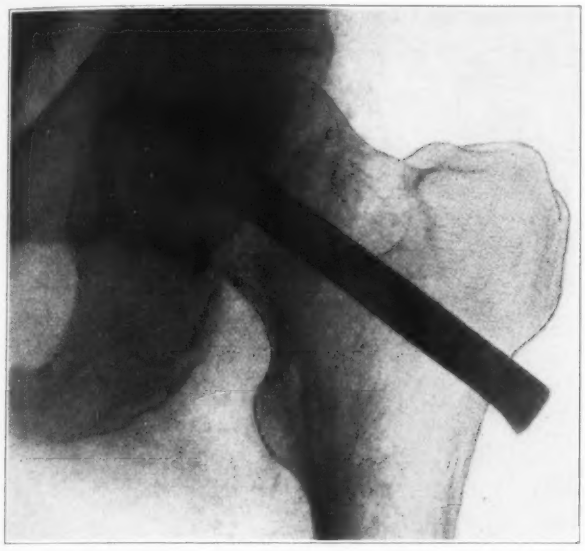


Fig. 1
Recent fracture of the neck of the femur held by Smith-Petersen nail. See Fig. 6 for lateral view of the same hip.

most elderly. Such an achievement is one of the finest developments in fracture work in recent times and is worthy of the name of "modern" as distinguished from former methods, which, we believe, will become almost obsolete.

The disadvantages of these former methods are well known. The discomfort of the patient, the long weeks of confinement in bed, either in a hospital or at home with an expert nurse, the sometimes fatal complications in bed-ridden elderly people, and the exhausting of financial resources, are a picture familiar to almost every physician. Although not so generally known, perhaps, but equally grave, the failure to obtain a solid, comfortable hip is not uncommon. Taking the country at large, this fracture united in two-thirds of the patients under 50 years of age. Beyond that age only one-half united.

Now, however, this difficult and complicated problem has been made one of comparative simplicity by the method of nailing. In this way the fracture is held so securely that pain is immediately relieved and the injured person may sit or turn in bed without assistance. If necessary to prevent complications, the elderly may be placed in a wheel chair the day following operation. By the fifth day these people have considerable use of the entire extremity. They can flex the hip and knee joints and raise the leg completely off the bed. They leave the hospital on the eighth or ninth day, and begin walking with crutches in a few weeks.

This manner of handling broken hips was begun by Johannson, of Sweden, and others several years ago, but its general adoption was

Fig. 2
These patients may sit in a wheel chair the next day after reduction of the fracture.

Fig. 3
Motion of leg on the fourth postoperative day.

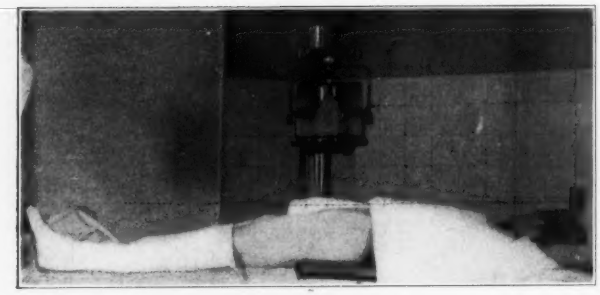


Fig. 4

Position on the operating table for reduction and nailing of the fracture with x-ray tube above and cassette tunnel under the hip. X-ray may be taken without moving the patient, and with speed and accuracy.

slow, probably because at first it seemed to be a radical procedure. The Smith-Petersen nail, as formerly used, required a large incision for exposure of the fracture; an undertaking too shocking for elderly people. By changing the manner of inserting the nail, a new field in the treatment of fractures of the neck of the femur was discovered. It was found that the fracture could be nailed blindly, using the x-ray as a guide. This may now be done with a minimum of surgery and absence of shock; with "local" or a brief general anesthesia, and is applicable to all of these fractures in people of any age.

Once considered radical, the procedure is now in frequent use.* It is the most humane way of treating these hips and should, if possible, be made available to all having this injury. If facilities are not near at hand, there is no objection to transportation of the patient. With gentle handling and good nursing these people may be moved comfortably by ambulance for a considerable distance without risk.

In the above discussion we have spoken of the comparative ease of this treatment. By this we do not imply that the actual surgery is simple. The operation is a major undertaking and requires the same experience and care necessary for good results in bone and joint surgery in general. The fracture must be reduced accurately before nailing and the nail must be properly inserted; otherwise one is confronted with disappointing results.

Two years ago we abruptly discontinued the method of applying plaster casts for fractured necks of the femur and adopted routinely nail fixation. We now have thirty-two cases, treated with uniform success. The ages range from 27 to 92. Without including recent cases, none has failed to unite. There have been no fatalities. We strongly urge the use of the Smith-Petersen nail instead of pins, screws, and so on, as we believe it holds more securely, even though it may require more accuracy in placement. The plan of procedure is as follows:

The injured person is placed on the Hawley table in the regular operating room. A portable shock-proof x-ray unit is rolled up to the table

*Dr. Wescott, of Roanoke, Virginia, had much to do with the introduction of the method in this country and has slightly modified the construction of the Smith-Petersen nail.

Fig. 5-A

Fig. 5-B

(A) and (B) Method of taking lateral x-rays of the hip. The x-ray tube and cassette tunnel are in the same position as for the anterior-posterior view.

Fig. 6
X-ray of lateral view of hip.

with the tube centered over the head of the fractured femur. A cassette tunnel is placed under both hips. The x-ray unit and film are operated entirely from the unsterile side of the table. The head of the femur is located at the junction of the femoral artery and Poupart's ligament and a lead marker is fastened to the skin with adhesive tape at this point. This marker helps us in directing the nail. The field of operation is painted with iodine and alcohol and the entire extremity is draped separately to permit manipulation by the operator. Under gas anesthesia or, if preferred, procaine hydrochloride given locally, the fracture is reduced by internal rotation. In our experience this maneuver alone reduces a great many of these fractures. Traction is seldom necessary. With the leg held in the position of internal rotation and made steady by an assistant, a three-inch lateral incision is made over the trochanter of the femur and the nail is driven across the fracture line and partly into the head. X-rays are then taken to verify the position of the nail. Both views of the fracture are taken without moving the x-ray tube. The lateral view is obtained by flexing the hip to a right angle with a slight amount of abduction. With a dark room a few feet away and with the use of a special developing technic with concentrated warm solutions, very rapid pictures can be taken. If the alignment of the nail is accurate in both views, it is then driven deep into the center of the head and the wound closed. The patient is returned to bed awake and may sit immediately, if necessary.

SUMMARY

Thirty-two cases of recent fractures of the neck of the femur, nailed with the Smith-Petersen nail, are discussed. All cases have worked out successfully and we have adopted this procedure as routine in people ranging from 27 to 92 years of age.

DISCUSSION (*Abstract*)

Dr. Austin T. Moore, Columbia, S. C.—I want to congratulate Drs. Thornton and Sandison on their beautiful presentation and the splendid clinical results they have accomplished. During the past few years a number of men have independently worked out original methods of internal fixation for fresh fractures of the hip joint. This particular problem, especially in the aged, has been called the "unsolved fracture." Let us hope that we are approaching the solution.

I should like to present the method which we have been using for almost two years with increasingly gratifying results. Briefly, our technic is as follows: local anesthesia is used throughout the operation. The hip joint is injected with approximately 30 c. c. of 2 per cent procaine hydrochloride. The point of injection is ¾ inch below the inguinal ligament and ½ inch lateral to the femoral artery. Perfect relaxation can be obtained and the fracture is reduced more or less according to the Leadbetter technic. An x-ray exposure is made to check reduction. A tunnel underneath the patient allows the films to be slipped in from the opposite side of the table. A mobile x-ray unit in the operating room makes the work easier. While this film is being developed the skin and subcutaneous tissue over the outer side of the thigh beneath the great trochanter is injected with procaine hydrochloride, and an incision about four to five inches in length is made. With a finger in the wound the fracture can be palpated and position fairly accurately determined. If the x-ray shows satisfactory reduction the head is fastened in place by means of three small stainless steel pins. The pins are spear-pointed, threaded in their outer portion, and have a small nut which makes their length easily adjusted. Without any difficulty they are inserted by using a small chuck handle and they can readily be changed when necessary. One can feel the pin as it travels up the soft medullary portion of the neck into the head, and with a little experience it can be accurately placed. The head is fastened in position in, roughly, a tripod fashion. The

mechanical fixation is very solid. With the nut against the bone the pin becomes a nail and the fracture can be tightly impacted by striking the ends of the pins with a mallet. X-rays are now made to check the position of the pins. The lateral view is made by flexing the thigh to a right angle. If the position is satisfactory a small piece of soft stainless steel wire is wrapped from one pin to the other. This prevents the nuts from coming off and prevents the pins from working out backward. The projecting ends of the pins are cut off with a pair of wire nippers. According to the idea of Bozsan we always make several additional drill holes to increase the blood supply to the head. The wound is closed loosely with interrupted sutures. No external fixation is used and the after-care of the patient is the same as carried out by Dr. Thornton.

This operation is practically free from shock. It can be done easily with little expense to the patient, and no complicated or special equipment is necessary other than the pins which are very inexpensive. The mechanical support is substantial, and it is impossible for the fragments to become separated. The fracture is impacted and additional drill holes give increased blood supply. A bone graft may also be used if desired.

Since March, 1933, we have had thirty-nine cases ranging in age from 23 to 93 years. There have been no deaths from the operation, no infections, and no loss of position. In our first ten cases we used straight pins without nuts. This form of fixation proved inadequate and our first two cases seem to have only fibrous union, but the clinical result is very satisfactory. All other cases are apparently progressing to good bony union. We shall not classify any case as an end result until at least two years have passed from the time of the accident. Many of the patients are old, debilitated, cannot live as long as two years, and compilation of accurate statistics will be difficult. We are not claiming, nor are we expecting, that the operation will give perfect results in all cases. We have had no calamity so far and no cause to regret using it in a single instance. We feel that it is a decided improvement over the methods we used previously, but, no doubt, better ideas and an improved technic will be developed as time goes on. We are impressed by the results and believe that the fundamental principles of perfect reduction, complete and permanent fixation of fragments, plus active use of the extremity, will be recognized as essentials in the treatment of hip joint fractures.

THE DIAGNOSTIC VALUE OF A SKIN LESION, TUBERCULID*

By HOWARD HAILEY, M.D.†
Atlanta, Georgia

So far as the essayist has been able to learn, the clinical picture, multiple ganglia, tenosynovitis and hydrarthrosis with associated lichen scrofulosorum, has never been reported. The unusual association and the rarity of lichen scrofulosorum prompted this report. In "Modern Clinical Syphilis" (Stokes, first edition, page 725) there is a photograph of a patient with lichen scrofulosorum and hydrarthrosis.

CASE REPORT

H. M., aged 6, a white boy, entered Egleston Memorial Hospital October 11, 1934.

From the family history, eight children were living, ages 3 to 26. Five were dead. Two children died when ten days old, and there had been three miscarriages.

Physical examination revealed multiple nodular swellings about the wrist joints and dorsa of the hands, the knee joints, ankle joints and dorsa of feet and a skin rash.

The temperature was 99.6°, pulse 110, respiratory rate 24, weight 53 pounds, height 45.25 inches. Urine was negative. The stool examination revealed ova of *Ascaris lumbricoides*.

X-ray examination of chest, long bones and joints was negative except for fluid in both knee joints.

October 14, the provisional diagnosis by the visiting pediatrician was bursitis and tenosynovitis, possibly luetic.

October 15, the left ankle was aspirated. Fluid was white and cloudy. There was a cell count of 7,700; polymorphonuclears were 60 per cent, and lymphocytes 34 per cent.

October 17, culture was reported negative. The Wassermann was negative.

October 18, the tuberculin test, using 0.1 mg. old tuberculin, was reported negative.

Fig. 1
Lichen scrofulosorum.

*Read in Section on Dermatology and Syphilology, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

†Associate Clinical Professor of Dermatology, Emory University School of Medicine; Dermatologist, Grady Memorial Hospital (White Unit), Georgia Baptist Hospital, Crawford W. Long Hospital, Egleston Memorial Hospital for Children, and Atlanta Cancer Clinic.

October 27, antiluetic treatment was instituted. The treatment consisted of neoarsphenamine and bismuth alternated every four days through December 5 (six doses of neoarsphenamine and four doses of bismuth). No improvement was noted.

December 8, 10 c. c. of turbid straw-colored fluid were aspirated from the left knee joint. The cell count was 23,000; specific gravity, 1.025; polynuclears, 80. Culture and guinea pig inoculation were negative.

Fig. 2
Showing involvement of tendon sheaths about the wrist.

During the stay in the hospital the temperature was elevated almost every day. Frequent comments as to the presence of the rash were made by the visiting pediatrician and interns.

December 11, a saturated solution of potassium iodide and mercurial inunctions were ordered by the visiting pediatrician.

February 18, 1935, another visiting pediatrician saw the patient and expressed an opinion that the rash was due to iodide. On this date a dermatological consultation was requested.

February 18, 1935, a dermatological consultation was obtained. On inspection there was a widely distributed eruption over the face, neck, body and extremities. The eruption consisted of skin-colored, pinkish and pinkish-brown, flat-top papules arranged in various sized patches. Many of the papules were covered with small, thin scales. Apparently, some lesions were regressing and many had recently developed. Over both forearms there was an appearance of stippled atrophy marking the site of previous patches. No true scarring presented. There was no evidence of scratching and a history of subjective symptoms was absent. The eruption had been present since an attack of measles about four years before admission to the hospital.

There were multiple subcutaneous nodular swellings about the wrists, hands, knees, ankles and feet.

The diagnosis of lichen scrofulosorum and multiple ganglia was offered. I expressed an opinion that the hydrarthrosis of the knee joints was probably tuberculous and that the ganglia, probably, resulted from the infection of the tendon sheaths.

March 16, a ganglion was resected. The pathologist reported tuberculosis of the tendon sheath. A portion of the sheath was macerated and injected into a pig. After fifteen days the pig showed definite dis-

Fig. 3
Showing positive tuberculosis test on forearm.

Fig. 4
Hydrarthrosis of knee joints and tendon sheath involvement about wrists, knees and ankles.

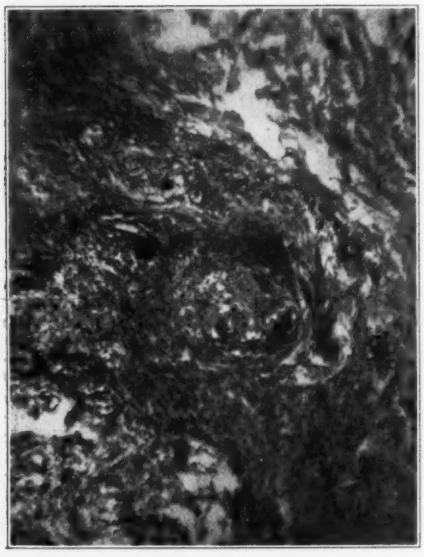


Fig. 5
Section showing tubercles. Low power.

ease. Sections from the killed pig showed tuberculosis.

July 2, I removed a biopsy specimen of the skin from each thigh.

Pathological Report.—April 25, 1935, section from tendon sheath of the wrist joint of H. M. S-35-86 was examined. The section is composed mostly of loosely connected fibrous tissue, containing many scattered, thin-walled blood vessels, lymphatic spaces and scattered islands of red blood cells. Within this connective tissue bed are seen small, irregular sized, circumscribed miliary tubercles. These tubercles are composed of giant cells, lymphocytes and fibroblasts. In the central portions the tubercles are quite well organized and are typical of those seen in chronic proliferative tuberculosis, except that caseation has not yet occurred to any appreciable extent. In the low power field there may be seen three or more tubercles, which indicates the extensiveness of the process.

July 20, 1935, section from the skin shows tubercles identical with those from the tendon sheath of the wrist joint.

Material aseptically removed from the wrist joints of H. M., composed of a fibro-myxomatous, membranous tissue, was cut into small pieces and ground up in a sterile mortar. This material was injected into a 250-gram, healthy guinea pig, both subcutaneously and intraperitoneally. On the fifteenth day this pig was killed and microscopical studies revealed tubercles throughout the pig's liver and in the inguinal spaces. The organisms were stained in the tissues by the hematoxylin-fuchsin method and were definitely recognized as being tubercle bacilli.

The diagnosis by Dr. Jack C. Norris was tuberculosis of the tendon sheath of the wrist joints and skin.

A public health nurse at this time, at the request of the hospital, tested other members of the family who were at home and reported by letter that the mother of the patient and four other children gave a positive tuberculin test.

During the last months of the child's stay in the hospital several operations were performed in an effort to cure the ganglia. However, the resected ganglia on the dorsum of the left hand were recurring when the child left the hospital. There was no appreciable change in the eruption. The mother came from a distance of about 200 miles and took the child home. The mother's Wassermann was negative. It was not practical to pursue further study of other members of the family.

COMMENTS

In spite of the widespread disease in this case, the boy was growing normally. Why did the tubercle bacillus single out the skin and serous membranes of the tendon sheaths and knee joints? My belief is that a certain strain of the tubercle bacillus which has a predilection for those tissues was responsible. If the skin rash had not been diagnosed, study of the resected tendon sheaths would probably not have been carried out, as fluid from the ganglia and knee joints had been studied without arriving at a diagnosis.

In closing, I wish to thank Dr. Hines Roberts, Medical Director of Egleston Memorial Hospital, for the privilege of reporting this case; also to thank Dr. Jack C. Norris for pathological study of the case, and Dr. Fred Weidman for a review of the slides.

Suite 915 Candler Building

THE ROENTGEN RAY EXAMINATION OF THE COLON IN THE STUDY OF AMEBIASIS*

By JOSEPH C. BELL, M.D.
Louisville, Kentucky

Craig defines amebiasis as the invasion of the tissues of man by the pathogenic ameba, *Endamoeba histolytica*. Amebic dysentery is only one of the manifestations of this condition and extensive invasive changes may be present in the large bowel without evidence or a previous history of dysentery. Much has been written concerning this disease, and Craig, in his recent book entitled, "Amebiasis and Amebic Dysentery," reviews in a very comprehensive manner most that is now known about the disease.

My presentation will be limited to the roentgenologic study of the colon in amebiasis. This

*Read in Section on Radiology, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

type of examination may be of definite aid in diagnosis, although it probably cannot be considered a primary factor. Examinations done at intervals during the period that the patient is under treatment may yield considerable information concerning the progress of the disease.

Vallarino, in the *American Journal of Tropical Medicine* (Vol. 5, 1925), presents the roentgen findings noted by him in several cases of amebic dysentery seen in the canal zone. Webber, in the *American Journal of Roentgenology* (October, 1933), in discussing the subject of chronic ulcerative disease of the colon described changes observed in chronic amebic dysentery. He called attention especially to the abnormally small, often irregular cecum observed in all of the cases in which he had made a diagnosis of chronic amebic dysentery. He also noted an unusual degree of incompetency of the ileocecal valve which permitted the opaque material to flow from the cecum into the terminal ileum almost unobstructed.

In the *Journal of the American Medical Association* (December 16, 1933) Ikeda presented the roentgenologic findings in cases of amebic dysentery observed during the months of October and November of the year 1933. All of these cases were traced to Chicago, the infection taking place during the latter part of the summer of 1933. He described much the same deformity of the cecum that was observed by Webber, together with similar changes in the behavior of the ileocecal valve. He found evidence of ulceration, together with narrowing of the lumen and decrease in the length of the colon, and stated that the roentgen examination might well be of considerable aid in differential diagnosis of the various types of colitis.

Other writers have presented illustrations of some of the roentgenologic manifestations of this disease, but considering the extensive literature concerning it a relatively small space has been devoted to the roentgen examination. For this reason I shall present the findings in some of the cases that I have seen and consider the changes that have been observed during treatment.

CLASSIFICATIONS

According to the symptoms presented by persons harboring *Endamoeba histolytica,* the cases may be classified as so-called "healthy carriers;" cases with very mild gastro-intestinal symptoms apparently due to this infection; acute amebic dysentery and chronic amebic dysentery. A fifth classification termed subacute amebic dysentery is sometimes added, for some cases do not appear to belong under either the heading of acute or chronic dysentery.

In the so-called "healthy carrier" group changes in the bowel are slight, and it has been my experience that such individuals present no abnormalities of the colon detectable by the roentgen ray. Craig believes that the term "healthy carrier" is a misnomer, for it is his opinion that if *Endamoeba histolytica* can be demonstrated in the bowel, lesions microscopic or otherwise are also present.

The second classification, that of the individual with rather vague gastro-intestinal symptoms also harboring *Endamoeba histolytica,* will, in most instances at least, reveal no abnormality of the colon upon roentgen examination.

Cases of acute amebic dysentery are divided by Craig into the acute fulminating, usually rapidly fatal type, and the much less severe acute cases which are seldom fatal during the early course of the disease. He believes that the very acute course of the disease in the first group is due to mixed infection and not to *Endamoeba histolytica* alone. A massive mixed infection has always appealed to me as a plausible explanation of the peculiar virulence in many of the Chicago cases. In the very acute fulminating type of disease the roentgen examination obviously has no place in either diagnosis or study of the course. Anyone who has observed one of these cases clinically, or has seen the changes in the large bowel at operation or autopsy, can readily appreciate that such a study would be next to impossible and might be highly dangerous as well.

In the acute cases of the ordinary type the roentgen examination is also often unsatisfactory because of the irritability usually present in the infected bowel and the pain experienced by the patient when the colon is filled. In one case examined the lumen of the bowel was found to be narrow and irregular, the changes being those of an acute ulcerative colitis, but in themselves not characteristic of any particular infection. It was impossible to fill the cecum because of the marked irritability of the distal half of the bowel. An irregular mass with narrowing of the lumen was seen at the splenic flexure which in itself gave a clue to the nature of the infection. This disappeared promptly under anti-amebic therapy.

In the cases that I have classified as subacute amebic dysentery, there has been irregular narrowing of the lumen of various

parts of the colon sometimes associated with a palpable mass. In these individuals the characteristic deformity of the cecum described by Webber and Ikeda was noted. The relatively short duration of the illness without any history of similar previous attacks, together with the prompt response to therapy with apparent complete disappearance of the masses and deforming lesions, have not been in keeping with the changes that occur in chronic amebic dysentery, as I understand this term. In one of these patients, as will be seen from the case report, there was absolutely no history of a dysentery previous to the time of the first examination, her only symptoms being pain before bowel movements and constipation. The colon in this individual showed the most extensive changes observed in any of my cases, although the subjective symptoms were relatively slight.

Craig has pointed out that in some amebic infections the principle involvement takes place in the submucosa, and it would seem that involvement of this type may account for the large firm tumors noted in some cases and also for their prompt disappearance under therapy. This may also explain the fact that the bowel in many of these patients appears normal after clinical cure has taken place.

There has been nothing that would differentiate the cases of chronic amebic dysentery observed by me from the usual type of chronic ulcerative colitis, except the fact that all have shown a rather characteristic deformity of the cecum. The length and diameter of the colon have usually been less than normal and localized areas of narrowing as well as irregularities undoubtedly due to ulcers have frequently been seen.

CASE REPORTS

Case 1.—A white adult male was admitted to the Norton Memorial Infirmary September 16, 1933, with a history of having been well until September 5, 1933, when he suddenly developed malaise, persistent diarrhea with mucus and blood, loss of appetite and nausea. This increased in severity until the time of his admission. He had visited Chicago during the summer of 1933, but at which hotel he stayed is not known. He gave an indefinite history of previous attacks of diarrhea at intervals for several years, which may well have been amebic in origin. Upon admission the stools were found to contain the motile form of *Endamoeba histolytica* in large numbers. There was tenderness over the liver and an elevation in temperature. A laparotomy was done and a large liver abscess drained. The patient died two days later and autopsy showed an extensive acute amebic ulcerative colitis together with multiple amebic abscesses of the liver.

Fig. 1 shows the marked changes present in this bowel, the most extensive being around the ileocecal valve. There was no evidence of ulceration in the terminal ileum. The cecum was contracted and the walls of the entire proximal colon were markedly thickened. The type of contraction of the cecum was very similar to that observed by barium enema in non-fatal cases.

Case 2.—This patient, a middle-aged white female, entered the Norton Memorial Infirmary on August 31, 1935, giving a history of diarrhea, nausea and lower abdominal pain extending over a period of two weeks. She had been perfectly well previous to this time and had never had a diarrhea before. She lived in Chicago during the year 1932, but was not there at any time during the year 1933.

Upon admission stool examination showed many cysts characteristic of those of *Endamoeba histolytica*. Roentgen examination was decidedly unsatisfactory due to the marked irritability of the bowel. For this reason only the distal half of the colon could be filled. The findings were those of an acute ulcerative colitis. A large irregular defect was noted in the region of the splenic flexure which suggested extensive invasion of the wall of the bowel and was of the type seen in other individuals with amebic dysentery.

The patient improved symptomatically very rapidly under treatment, and reexamination one month later showed that the mass in the region of the splenic flexure had disappeared and aside from moderate irritability the colon seemed normal. Trophozoites were not demonstrated in the stool at any time, but cysts were numerous during the early part of the time the patient was in the hospital. These disappeared rapidly under treatment and were absent at the time of our second examination.

Fig. 1, Case 1

Autopsy specimen. Diffuse ulceration of the cecum most marked around the ileocecal valve. Extensive ulceration in the ascending colon as well. The terminal ileum is free from involvement.

Case 3.—This patient, a white middle-aged female, was first examined in my office May 29, 1934. She gave a history of constipation throughout the greater part of her life, but had never suffered from diarrhea. She visited her physician because of pain in the lower abdomen, which came on two or three hours before a bowel movement and increased in severity until the time of the movement. Evacuation was followed by relief and a diarrhea was not present at any time nor was any blood noted. These symptoms had extended over a period of two months and had gradually increased in severity. Her physician prescribed medication for the purpose of controlling her constipation and advised her to return in ten days. The pain became more severe and when she returned a large firm, elongated, non-tender mass was found extending across the lower abdomen just above the symphysis. The patient was then advised to come to my office for examination.

The roentgen examination of the colon showed marked irregular deformity of the lumen of the bowel extending from the middle third of the rectum well beyond the splenic flexure, together with evidence of ulceration. A peculiar cone-like deformity of the cecum, together with unusual incompetency of the ileocecal valve, was noted. The palpable tumor in the lower abdomen was found to be due to pronounced thickening of the wall of the sigmoid. The appearance of the colon at this time is shown in *Fig. 2*. The above changes were described and it was stated that the most probable cause was an amebic infection of the large bowel. The stools were examined and numerous motile amebae found.

Under therapy the patient at first developed a severe diarrhea with temperature, mucus and blood. This was

Fig. 3, Case 3

The condition of the colon as shown with barium enema five months after the patient was first observed and after thorough anti-amebic therapy. The distal colon is seen to be filled normally. The cecum and first part of the ascending colon are irritable.

Fig. 2, Case 3

Illustration shows extensive narrowing and irregularity of the lumen of the large bowel extending from the middle of the rectum to the splenic flexure. It also shows a peculiar cone-like deformity and contraction of the cecum.

Fig. 4, Case 3

Serial films showing irritability of the cecum with irritability of the adjacent portion of the appendix. A very small niche-like shadow can be seen projecting from the lumen of the appendix very close to its junction with the cecum, the appearance of which suggests a small ulcer.

followed quite promptly by improvement in her symptoms with control of the dysentery and the disappearance of the palpable mass in her abdomen. She was reexamined October 26, 1934, at which time the colon seemed to be normal and no evidence of the tumor mass previously noted could be detected. At this time the appendix filled. The portion immediately adjacent to the cecum was decidedly narrow and a small shadow definitely suggestive of ulceration projected from the lumen. There was an associated persistent spasm of the cecum. It was stated that there might well be amebic ulceration of the appendix and if so the pathologic appendix was probably causing reflex spasm of the cecum. The findings at this time are shown in *Figs. 3* and *4*.

This patient did very well for a short time, after which she developed a mass in the right side of the abdomen and returned to my office for examination December 28, 1934. The sigmoid was found to be displaced to the left and greatly narrowed. The appearance, as shown in *Fig. 5*, suggested that the narrowing and displacement were due to pressure from without and not to intrinsic disease. A large, firm palpable mass was noted in the right lower quadrant. This was somewhat movable and seemed to be connected with the appendix, for the appendix moved with it. Changes in the appendix suggestive of a pathology of some type were again noted. The patient entered the hospital January 13, 1935, and a laparotomy at this time showed the tubes to be acutely inflamed and rather markedly enlarged. Numerous cysts were present on the ovaries and some on the adjacent portions of the bowel. There were adhesions between the large

Fig. 6, Case 3

Illustration showing the condition of the large bowel seventeen months after the patient was first seen. The bowel was essentially normal at the time of this examination and the patient was free from symptoms. Previous to this examination the patient had thorough antamebic therapy and laparotomy with removal of tubes and appendix. Tone of cecum was normal.

Fig. 5, Case 3

Illustration shows the condition of the colon approximately seven months after the patient was first seen. The sigmoid and proximal part of the rectum were found to be greatly narrowed and displaced to the left, apparently because of extrinsic pressure. A large firm mass could be palpated in the right lower quadrant which was apparently separate from the colon. Cecum still very irritable.

Fig. 7, Case 4

Illustration shows the condition of the colon when the patient first entered the Norton Memorial Infirmary. The cecum is contracted and irregular and an unusual amount of barium has escaped into the terminal ileum. Abnormalities were limited to the cecum.

and small bowel. The appendix was enlarged and seemed actively diseased. The cysts were drained and the tubes and appendix were removed. The patient made an uneventful recovery.

Microscopic examination of the appendix showed numerous eosinophils throughout all portions of the wall, but amebae were not demonstrated nor were they found in the tubes. Special stains were not employed, which may account for the fact that amebae were not demonstrated. It was thought, however, that these changes were secondary to the amebic infection. The patient had never had a neisserian infection and there was no reason to believe that the gonococcus was the cause of the infection of the tubes. She has been entirely well since her discharge from the hospital. Reexamination October 25 of this year, as can be seen in *Fig. 6*, showed the colon to be entirely normal aside from very slight deformity of the cecum.

Case 4.—The patient, a white adult male, visited Chicago several times during the summer of 1933 and stayed at the Congress Hotel. He entered the Norton Memorial Infirmary December 6, 1933, giving a history of diarrhea with two to five stools per day for a period of five weeks previous to his admission. Repeated stool examinations showed a small number of moderately motile amebae, none of which contained red blood cells. These were classified at each examination as *Amoebae coli*. A barium enema showed the peculiar deformity of the cecum and behavior of the ileocecal valve that has been noted frequently in proven cases of amebiasis. Reexamination March 10, 1934, while he was still under treatment, showed only slight deformity of the cecum. The size was almost normal and the walls were flexible. None of the opaque ma-

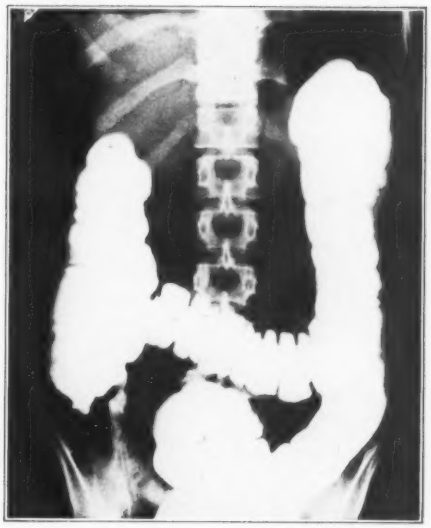


Fig. 9, Case 5

Illustration shows condition of the colon when the patient was first examined and before any treatment. The first symptoms of infection were noted seven weeks previous to this examination. Changes are limited to the cecum and are characterized by contraction of the cecum, a peculiar cone-like deformity and incompetency of the ileocecal valve.

Fig. 8, Case 4

Condition of the colon three months after antamebic therapy was instituted. The cecum is almost normal in size. The walls are regular and none of the opaque material escaped into the terminal ileum. Other portions of the colon are normal.

Fig. 10, Case 5

Examination one month later showed an increase in the deformity of the cecum and in the incompetency of the ileocecal valve. The changes are again limited to the cecum.

terial passed into the terminal ileum, although the cecum was considerably distended. The patient is now clinically well and anti-amebic therapy has been discontinued. The history, the changes in and about the cecum and the response to therapy would seem to justify a diagnosis of amebiasis. *Figs. 7* and *8* illustrate the condition of the colon before and during treatment.

Case 5.—The patient, a white adult female, visited the Congress Hotel, Chicago, for one day, August 16, 1933. She left for the West by train August 17 and on August 22 at 11:00 p. m. she began to experience severe lower abdominal pain. The pain continued and on August 24 she developed a diarrhea, having four to five stools containing considerable blood daily. The diarrhea and pain continued until August 30, but the symptoms were not sufficiently severe to prevent her from continuing her trip, although she began to lose weight and suffered considerable malaise. A second attack of dysentery took place on September 26, which lasted only one day, and the dysentery did not occur after that time. The patient continued to lose weight, however, and was first seen by her physician here early in October. He had the stool examined, which proved to be negative both for blood and for parasites. She was referred to my office for an examination of the colon October 4, 1933. The cecum, as is shown in *Fig. 9*, was found to be considerably deformed, and it was thought that this was the result of some inflammatory process, the true nature not being recognized at the time. There was no evidence of polypi or of a generalized colitis of any type.

It was thought best to observe the patient for a time, but she did not return to her physician until December 18. During the interval she had no diarrhea, but suffered from abdominal discomfort, gas, constipation, general malaise and loss of weight. I reexamined her December 9, 1933, and found a definite increase in the peculiar irregular contraction of the cecum and incompetency of the ileocecal valve noted at the first examination. The appearance of the colon and small bowel is shown in *Figs. 10* and *11*. The serial exposures in *Fig. 11* illustrate the constancy of the deformity and

Fig. 11, Case 5
Serial films show the deformity of the cecum to be constant, indicating that it was due to changes in the wall of the cecum and not to spasm.

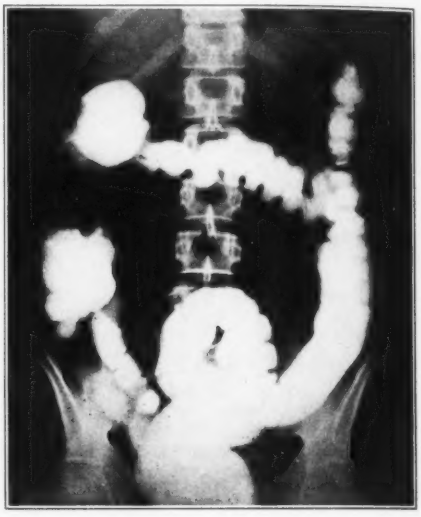


Fig. 12, Case 5
Illustration showing condition of the colon approximately three weeks after anti-amebic therapy was instituted. The cecum is larger and more regular in contour.

Fig. 13, Case 5
Serial exposures of the cecum showing the condition seven months after anti-amebic therapy was instituted. The cecum is flexible and much larger than before. Some spastic deformity was present at times during the examination.

indicate that this is due to organic changes in the wall of the bowel and not to spasm. In the meantime changes similar to these had been described in cases of amebiasis and it was reported that this was the probable explanation of the findings in this individual.

Very careful repeated examinations of the stools failed to reveal amebae, but the deformity seemed sufficiently characteristic to justify anti-amebic therapy. Treatment was begun about December 20 and continued at intervals for a period of seven months. The patient showed prompt clinical improvement and when she was reexamined in this office January 17, 1934, there was a definite decrease in the deformity of the cecum and less tendency for material to escape into the terminal ileum. This is shown in *Fig. 12*. Both the clinical and roentgenological findings continued to improve through the early part of the summer. In July the cecum was almost normal, although some increase in tone was noted, which can be seen in *Fig. 13*. Further treatment was given and the patient was reexamined January 9, 1935. At that time, as is shown in *Figs. 14* and *15*, the colon was found to be entirely normal. No treatment was given after the series in July, 1934. At the present time the patient is without symptoms, her weight is normal and she is in excellent health.

Although the *Endamoeba histolytica* was never demonstrated in this case, the history is characteristic, and I believe that the results of therapy prove that her infection was caused by this organism.

Case 6.—This patient, a white male in late adult life, entered the Norton Memorial Infirmary October 12, 1933, with a history of having acquired a dysentery, the first symptoms of which were noted in the summer of 1926, but it was thought that the actual infection took place on the Gulf Coast in 1925. When the dysentery was first noticed the patient visited his physician and a stool examination showed *Endamoeba histolytica* to be present. Anti-amebic therapy resulted in complete relief of symptoms, but the dysentery had recurred at intervals of about two years since that time. He was first seen by Dr. Louis Frank in September, 1933, because of a mild dysentery with general malaise and loss of weight extending over a period of

Fig. 15, Case 5

Serial films made one year after anti-amebic therapy was instituted show the cecum to be normal in size, tone and contour.

Fig. 14, Case 5

Illustration showing the condition of the large bowel one year after anti-amebic therapy was instituted. The entire colon, including the cecum, is normal.

Fig. 16, Case 6

Illustration showing condition of the colon in the presence of an acute exacerbation of a chronic amebic dysentery. Irregular narrowing of various parts of the lumen of the bowel can be seen.

about three months. Proctoscopic examination in the office of Dr. Frank showed ulceration of the sigmoid and microscopic examination of material removed revealed *Endamoeba histolytica* to be present. Motile forms were again demonstrated in the Norton Memorial Infirmary. An x-ray examination of the colon in the Infirmary October 13, 1933, illustrated in *Figs. 16* and *17*, showed changes considered to be due to a chronic ulcerative colitis. The cecum was contracted and irregular and a large amount of the opaque material escaped into the terminal ileum. This patient was given very thorough anti-amebic therapy extending over a period of four months. He made a very prompt recovery and has been entirely well for the past twenty months.

Fig. 17, Case 6

Condition of the bowel shown after partial evacuation of a barium enema. The cecum is contracted and an unusual amount of barium can be seen in the terminal ileum.

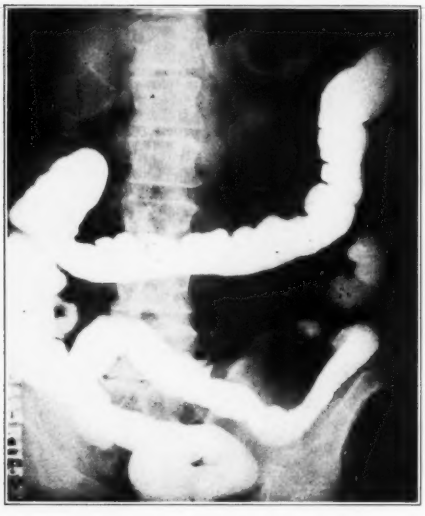


Fig. 18, Case 6

Illustration shows the condition of the large bowel approximately one year after the patient was first seen and following thorough anti-amebic therapy. The colon was essentially normal at the time of this examination.

Reexamination of the colon in this office on November 5, 1935, as can be seen in *Fig. 18*, showed a colon that was essentially normal with no evidence of ulceration. The sigmoid was quite long. The lumen of the bowel was normal in size and regular in outline.

Case 7.—This patient, a young adult white female, entered the Norton Memorial Infirmary September 10, 1934, with a history of repeated attacks of dysentery at intervals over a period of eight years. The *Endamoeba histolytica* had been demonstrated on numerous occasions and was undoubtedly the etiological organism. At the time of admission she was actually ill and was having from ten to twelve stools containing mucus and blood per day. The stools were examined and cysts characteristic of those of *Endamoeba histolytica* were demonstrated. She entered the infirmary only for diagnosis and was discharged on September 15 only slightly improved. She had been given a course of treatment just before admission. Treatment has been continued since discharge and decided improvement has resulted, although she is still far from well. *Fig. 19* illustrates the condition of the colon upon admission.

An examination of the colon in the hospital showed changes characteristic of a chronic ulcerative colitis with little to indicate the type. It was impossible to fill

Fig. 19, Case 7

Illustration showing the condition of the colon in the presence of an acute exacerbation of a very severe chronic amebic dysentery. The illustration is not very satisfactory due to the fact that the patient could not retain the enema. The lumen of the bowel showed numerous irregular areas of narrowing with a decrease in the total length of the bowel.

the cecum satisfactorily because of the marked generalized irritability present in all parts of the bowel.

CHANGES OBSERVED DURING TREATMENT

I have followed only one case of acute amebic dysentery during treatment. When first seen, the changes were those of an acute ulcerative colitis with marked irritability, evidence of ulceration and what appeared to be a mass in the region of the splenic flexure. Under treatment the mass disappeared, the lumen of the bowel became normal in size, the evidence of ulceration disappeared and the tone of the colon became essentially normal. This was shown very satisfactorily at the second examination.

In the cases classed as subacute the improvement under therapy has been very striking. No abnormality can be detected at present in one case now followed for more than two years. The apparent complete repair must indicate that the muscular tissue of the colon was not severely damaged by the disease and that the scar tissue formation in the mucosa and submucosa was of very limited extent.

Of the chronic cases only one has been followed sufficiently long to determine the extent of repair. In this individual two years after treatment was instituted, a barium enema showed the large bowel to be essentially normal. There was no decrease in its length and no localized areas of narrowing were found, although both were present at our first examination. In the cases with extensive scar tissue formation, it is unlikely that the deformities due to this will change to any appreciable extent under treatment, but the acute changes due to reactivation of the old infection or to a reinfection may largely disappear, providing treatment is adequate. Further study of the chronic cases may show that the ones with extensive scar tissue formation are actually the result of a mixed infection.

COMMENT

The peculiar deformity of the cecum and the abnormal behavior of the ileocecal valve are the most constant and most characteristic x-ray findings I have observed in amebiasis of the colon. This has also been true in cases reported by other examiners. Further experience with the roentgen examination may well prove these findings to be of great diagnostic significance.

The deformity of the cecum is of a type seldom seen in other diseases. There is a relatively rare hyperplastic form of tuberculous infection that sometimes resembles it and at times carcinoma of the cecum may simulate it quite closely. However, with a careful history and proper laboratory investigation, the diagnosis will usually be apparent.

The number of cases followed by me is not sufficient to justify any final conclusions concerning the roentgenologic signs of the various types of amebic infection or the results of therapy. It does seem evident, however, that there is a field for roentgen investigation in this disease, and it behooves the roentgenologist to be familiar with the manifestations of amebiasis, for with this knowledge he may aid materially in the diagnosis and adequate treatment.

402 Heyburn Building

DISCUSSION (*Abstract*)

Dr. Henry E. Meleney, Nashville, Tenn.—Dr. Bell has demonstrated very clearly, as Vallarino and others have done previously, that subacute and chronic amebic dysentery produce definite roentgenological changes in the colon. The question as to whether these changes are diagnostically different from changes produced by non-amebic ulcerative colitis must await the judgment of wider experience. Certainly the changes in the cecum seem to be very characteristic, and when present should lead the roentgenologist to suspect amebic infection. The absence of roentgenological findings in symptomless "carriers" of *E. histolytica* is interesting in view of the difficulty of proving whether in such cases the amebae have actually invaded the tissues or are living as commensals in the lumen of the colon. It may be that some of these cases would show tissue invasion without definite ulceration, as occurred in an autopsy at Vanderbilt Hospital.

One of the striking points in Dr. Bell's presentation is the rapid disappearance of abnormal contours in the colon after treatment, in spite of the previous appearance of ulceration, "infiltration" and narrowing of the lumen. This may be partly explained, I believe, by the fact that a prominent part of the microscopic pathology of amebic ulceration is edema, localized mainly to the submucosa adjacent to the ulcers, with a normal intestinal wall between the lesions. If the ulceration is confluent the edema and deformity will be extensive, but will still not greatly involve non-affected areas. Even shallow acute involvement of the mucosa may be associated with edema of the submucosa. There may or may not be much cellular infiltration with the edema, depending upon the presence or absence of secondary bacterial infection. With the disappearance of the amebae in the course of treatment, the edema will subside, and if the ulcers are shallow new epithelium will rapidly cover them. Only with the development of scar tissue would one expect permanent deformities to result. I have seen a case in which a chronic amebic ulceration produced an actual stenosis of the ascending colon which was diagnosed by the roentgenologist as carcinoma, but in which resection was followed by amebic ulceration of the skin about the drainage wound.

Roentgenologists are to be congratulated on the fact that they can occasionally diagnose a case of amebic

colitis for the clinician. Although, as one of Dr. Bell's cases indicates, amebae may be very difficult to find in certain cases, it too often happens that amebiasis has not been thought of, or that the laboratory technician has not been trained to recognize the cysts of *E. histolytica*. Roentgenologists will do a great service by making clinicians more alert to the possible occurrence of amebic infection in atypical cases of abdominal disorders not only in the South, but in all parts of the country. It should be remembered that amebic dysentery is only one of several clinical manifestations of amebiasis. Between 5 and 10 per cent of the population of temperate zones are infected with *E. histolytica* and a larger per cent in warmer regions, and any infected person may develop severe symptoms.

THE EPIDEMIOLOGY OF ENDAMOEBA HISTOLYTICA INFECTION IN TWO RURAL GEORGIA COUNTIES*

By D. L. Seckinger, M.D., Dr.P.H.†
Atlanta, Georgia

The Chicago outbreak of amebic dysentery in the fall of 1933, as a result of which over 800 cases and 40 deaths occurred throughout the United States, was probably more responsible than any other factor in the revival of interest in attempts to secure a better knowledge of the epidemiology of the disease in this country. So far as the Chicago outbreak is concerned, several facts are outstanding: (1) there never has been an outbreak in this country of such wide distribution, intensity and severity; and (2) the outbreak was unique in that practically all of the cases were infected as a result of contaminated water from defective plumbing.

Prior to the Chicago outbreak a number of investigators had made possible the assembling of a sizable amount of literature to indicate that amebic infection is common in the United States. Walker and Sellards[1] in 1913 demonstrated that the parasite may be found in a considerable number of supposedly healthy individuals, as well as among those suffering with symptoms of the disease, an observation of great importance in the epidemiology of amebic infection in that it is the chronic carrier of the disease, and not the acute case that makes possible the transmission of this disease from man to man.

In 1911 Sistrunk[2] at the Mayo Clinic found that 25 of 145 patients, or 17.7 per cent, examined for amebic infection were positive. His work was important in that he was the first to call attention to the fact that approximately half of his patients had never resided elsewhere than in the Northern United States. His contribution was followed by that of Griffin[3] at the same clinic in 1913, who found 79, or 4.5 per cent, positive out of 17,000 persons examined, and later by Mogath and Ward[4], 1928, who found 36, or 7.9 per cent, positive out of 457 patients examined. Farther South, in Tennessee, Meleney[5] in 1930, out of 4,987 individuals examined, found 861, or 7.3 per cent, positive, and in 1932 Meleney, Bishop and Leathers[6], as a result of surveys in Tennessee, reported 2,305 positives, or 11.5 per cent, out of 20,237 individuals examined. In 1932 Craig[7] examined 189 officers of the Medical Corps of the United States Army at Washington, D. C., and found 24, or 12.7, positive, even though these physicians had never been out of the country. According to Craig[8], 16 important surveys over the United States have been made, and of a total of 49,366 individuals examined in these surveys, 5,720, or 11.6 per cent, were positive for *Endamoeba histolytica*. It can be readily seen that amebic infection in this country is of common occurrence wherever efforts have been made to determine its incidence, but it required a catastrophe like that of the Chicago outbreak to bring physicians and health officials to a full appreciation of the importance of the disease in this country.

The present study embraces a consideration of amebiasis in two rural Georgia counties, where an attempt was made to learn something of its epidemiology during the spring and summer of 1934. The dysentery area studied is roughly fifty miles northeast of the City of Atlanta, in Barrow and Walton Counties. Except for the two county seat towns of from 2,000 to 3,000 population each, the population is either entirely rural or dotted here and there by small towns. With reference to color, the population is predominatingly white, although numbers of colored tenants are found on the farms. Farming offers practically the only means of a livelihood for both races throughout the entire area.

A brief history of amebiasis in the particular area studied will suffice to furnish the information bearing upon the prevalence and severity of amebic dysentery. During the fall of 1933, at the request of several physicians, the Mayor of Bethlehem in Barrow County appealed to the State Board of Health for advice and assistance

*Read in Section on Public Health, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

†Chief, Division of Epidemiology, State Department of Public Health, Atlanta, Georgia.

in the control of a dysentery problem in that town, which they correctly termed amebic dysentery. Beyond making a cursory survey at that time, the State Board of Health was unable to furnish assistance until the spring of 1934, when, through the generous assistance of Dr. G. W. McCoy, director of the National Institute of Health, Miss Lucy Reardon, of his staff, was detailed to Georgia as micrologist to assist the Division of Epidemiology in the study of *Endamoeba histolytica* infection at Bethlehem. For very obvious reasons, which will be described later, our sphere of activity eventually had to be extended many miles in all directions beyond the town, but not until a study of conditions at Bethlehem indicated that such procedures were tantamount to a proper understanding of *Endamoeba histolytica* infection in the area.

The town of Bethlehem is composed of 42 families, all white. It is incorporated, but without sanitation according to modern standards. There is no public water supply and the people obtain water for all purposes from surface wells. At the time of our survey there was no approved method of sewage disposal. Open privies were in evidence everywhere, and because of the presence of farm animals in the town, flies were particularly prevalent, and homes, with few exceptions, were unscreened. In addition it may be said that each family "lived unto itself;" there were no common eating places, such as boarding houses, cafes and restaurants. Fresh vegetables were obtained from individual gardens and wherever milk was used it was generally obtained from privately owned cows.

SURVEY OF BETHLEHEM

Histories of 11 cases of amebic dysentery among residents of Bethlehem were obtained from family physicians who treated the cases. Epidemiological investigation of every case was made to determine possible sources of infection. At the same time a survey of the entire population was initiated to determine the incidence of *Endamoeba histolytica* infection among residents of the town. In addition to the ordinary smear methods of examination, cultures were made in many instances.

SUMMARY OF INVESTIGATIONS AT BETHLEHEM

Of the 11 individuals who gave clinical histories of amebic dysentery upon examination of feces, 7 out of 10 examined, or 70.0 per cent, were positive for *Endamoeba histolytica* infection. Only one, however, showed motile forms of the parasite at the time of examination.

Out of a total of 117 residents of Bethlehem examined for *Endamoeba histolytica* infection, one active case and 13 carriers were found, or 11.96 per cent. Thirteen out of the 14 positive cases were detected on the first examination; these were not reexamined until after treatment, but attempts were made to obtain two additional examinations of the 103 found negative on the first examination. Actually, however, of the number only 20, or 19.4 per cent, were examined as many as three times, and 10, or 9.7 per cent, were examined as much as two times. Only one positive was found among those reexamined, and consequently it is believed that with the methods employed the large majority of positives were found on the first examination. Hence it is probable that the 11.96 per cent infection rate is fairly representative of amebic infection in the area.

Epidemiological investigation of known cases at Bethlehem was made to determine possible modes of spread or sources of infection, and it soon became apparent that the infection was most probably introduced from an endemic dysentery area some five miles from town. The Bethlehem cases broke out following the moving to town of two white women in 1930, who contracted the disease in August and October, 1929. The latter had lived within a quarter mile of a colored woman who contracted the disease in 1926, and who had suffered relapses of varying intervals for some five or six years. It is interesting to note that the colored woman lived near a white disabled war veteran, who claims to have contracted the disease in the trenches in France during the World War. It is believed, however, that the ex-soldier probably carried the infection with him to France and under trench warfare conditions went down with acute manifestations, for in the area under discussion amebic dysentery was not uncommon as early as 1914, during which year a white man developed abscess of the liver, was operated upon by a reputable surgeon, and amebae were recovered from the abscess material. It appears then that the infection, which seems to be of an unusual virulence from prewar days, has been endemic in the area for more than twenty years. The significant point to be borne in mind is that between the soldier, the colored woman and the two white women, which offer a possible chain for the infection of Bethlehem residents, there was little likelihood of direct infection from food or drink, inasmuch as these families were widely separated by well-established

social barriers, and there was no known contact except through nearness of residence.

As stated previously, the original plan was to make a survey of Bethlehem, not only to determine the incidence of *Endamoeba histolytica* infection but also to establish possible sources, modes of spread, and means of control. Our investigation soon led us far afield, and in order to arrive at a better understanding of conditions under which the disease spread it was decided to extend our activities in all directions, which finally included practically all of two counties. It was obviously impossible to examine the entire population, so the sample selected included only the families of those who some time in the past had suffered with gastro-intestinal complaints of one kind or the other.

AMEBIASIS IN FAMILIES WITH ONE OR MORE SUSPECTED CASES

Among the families with histories of amebic dysentery a total of 332 individuals were examined in Barrow County, and of this number, 66, or 20 per cent, were positive for *Endamoeba histolytica*. Of the 66 positive 12, or 8.2 per cent, showed motile forms. It must be remembered that numbers of these individuals were suffering with amebic dysentery at the time of the examinations, and this no doubt is responsible for the relatively high per cent of motile forms. In Walton County 73, or 38.6 per cent, out of 189 examined were positive. Of the 73 positives, 20, or 28.8 per cent, showed active forms. The total number of positives for both counties, exclusive of Bethlehem, was 129, or 25 per cent, out of 521 people examined.

Age Groups.—With reference to the ages of those harboring *Endamoeba histolytica*, it may be seen from Table I that in the Walton County group 30.5 per cent and among the Barrow County group 27.3 per cent were under 15 years of age.

Table 1

Age Group	Walton		Barrow		Total	
	No.	Per Ct.	No.	Per Ct.	No.	Per Ct.
Under 1	0	0	0	0	0	0
0- 4	3	3.7	1	1.8	4	2.9
5- 9	15	18.3	6	10.9	21	15.3
10-14	10	12.2	9	16.4	19	13.9
15-24	15	18.3	7	12.7	22	16.1
25-34	13	15.9	10	18.2	23	16.8
35-44	7	8.5	14	25.5	21	15.3
45-54	14	17.1	6	10.8	20	14.6
55-64	3	3.7	2	3.6	5	3.6
65 and above	2	2.4	0	0	2	1.5
Total	82	100.0	55	100.0	137	100.0

It was observed, however, that only 2.9 per cent of the total positives occurred in the age group 0-4, and that 30 per cent occurred in the age group 5-14. These observations substantiate the assertion of Craig[9] that "young children possess no immunity, but that given even chance of infection, they became infected about as frequently as older children or adults," and closely follow the work of Faust[10] (1933), who found that "children below the age of 5 are less frequently infected than older children." He believes it is not because they possess more immunity but because they have had less time in which to contract the infection.

Sex.—As noted by a number of workers, including Strong[11], Simon[12] and Tao[13], male infections outnumber female. Of the positives in Barrow County, males outnumbered females in the ratio of 54.4 per cent as compared with 45.6 per cent for females, while in Walton County similar ratios obtained, 53.4 for males and 46.3 per cent for females (Table 2). From the table it may be seen that the infection rate is about 10 per cent higher among males than among females.

Table 2

SEX INCIDENCE

County	Males		Females	
	No.	Per Ct.	No.	Per Ct.
Walton	47	54.4	41	45.6
Barrow	37	56.0	29	44.0
Total	84	54.5	70	45.5

FAMILIAL INFECTION RATE

In families where as many as one case was found, as revealed by microscopic examination, an attempt was made to obtain examinations of all other members of the household. A surprisingly high familial infection rate was found, which corresponds to the experience of a number of investigators who from time to time have called attention to the high infection rate in families into which *Endamoeba histolytica* has gained entrance. It was found that in Barrow County, out of 31 families examined, 74 individuals were positive and 62 negative; an infection rate per cent of 54.4 for these family groups. Similarly in Walton County 38 families were examined, and out of a total of 154 individuals examined, 88, or 57 per cent, were positive for *Endamoeba histolytica* infection, and of a total of 69 families, or 290 individuals examined in both counties, 162, or 55.9 per cent, were positive (Table 3).

Table 3
FAMILIAL INFECTION RATE

	Walton		Barrow		Total	
	No.	Per Ct.	No.	Per Ct.	No.	Per Ct.
Active	32	36.4	20	27.0	52	32.1
Cysts	56	63.6	54	73.0	110	67.9
Total positive	88	57.0	74	54.4	162	55.9
Total negative	66	43.0	62	45.6	128	44.1
Total examined	154	79.3	136	76.8	290	78.2
Not examined	40	20.7	41	23.2	81	21.8

In several individual families the infection rate was as high as 90 per cent. One large family will be briefly considered not only to illustrate this point but also to show the variability of symptoms among those positive. There were 11 members of this household and 10 were positive for *Endamoeba histolytica* infection. One individual passing bloody stool at time of examination showed active forms; 7 showed precysts, 2 cysts, and 1 was negative. Incidentally it should be stated that the only negative was a child of 3. Symptoms varied from frank intermittent dysentery over months in 2 individuals, loose stools in 2, indigestion and poor appetite in 2, to no complaint in 5.

CORRECTIVE MEASURES

It was realized from the beginning that it would be difficult indeed to establish corrective measures in the town of Bethlehem, unless those harboring *Endamoeba histolytica* infections were found, treated, cured and additional sanitary measures instituted. Inasmuch as the chronic carrier is the spreader of the disease, examination of stools from every resident of the town was particularly desired and finally accomplished. All showing *Endamoeba histolytica* infection were treated with sodium iodoxy quinolinsulphonate (chinoform, Winthrop) as this appeared to be the drug of choice (Craig[14]); it is particularly effective for carriers, and of low toxicity. Through arrangement with physicians the drug was given out by prescription from the physicians, but no medicine was prescribed until arrangements were made for the universal installation of the government-approved type of sanitary privies. These arrangements were made and carried to completion through the local FERA and with the assistance of Mayor and Council and the State Department of Sanitary Engineering. A public water supply was also considered, but costs seemed prohibitive, and families continued to use their own wells.

Of the 14 individuals treated for *Endamoeba histolytica* infection at Bethlehem, 12 were apparently cured with the first treatment, inasmuch as at least four negative stools were obtained from each over an interval of one year after treatment; one required the second treatment and one was not examined after treatment. On the basis of these results, it is believed that amebic infection was effectively controlled, at least temporarily. Clinically the results have been most satisfactory during the 18 months that have intervened since the treatments. No new cases have arisen, nor have relapses occurred among those treated. From all appearances it seems that the primary objective, namely, to control amebic dysentery at Bethlehem through treatment, and the improvement in the methods of disposal of human excreta, have been successful.

In addition to those treated at Bethlehem, a total of 133 individuals were treated elsewhere in Barrow and Walton Counties. Of this number, 109, or 81.9 per cent, were apparently cured

Table 4
AMEBIASIS IN HOUSEHOLD OF ELEVEN INDIVIDUALS

Name	Color	Sex	Age	History of Amebiasis	Result of Laboratory Examination
J. W. C.	W	M	39	Intermittent and bloody stools; past 5 months constipation	Cysts
A. C.	W	F	42	Indigestion. No appetite	Pre-cysts
A. C.	W	M	26	None	Pre-cysts
M. C.	W	F	21	None	Pre-cysts
E. W. C.	W	M	13	Bloody stools for past week. Similar attacks for one year, followed by constipation	Active (amebae)
I. C.	W	F	11	None	Cysts
H. C.	W	M	8	Indigestion, no appetite	Pre-cysts
H. C.	W	F	8	Mother states "bad stomach trouble." Loose stools, no blood	Pre-cysts
W. C.	W	M	5	Loose stools, followed by constipation	Pre-cysts
W. C.	W	M	5	None	Pre-cysts
A. M. C.	W	F	3	None	Negative

After treatment four negative laboratory examinations were found for each of these cases.

after the first treatment. Among the 24 that were positive after the first treatment, 21 were negative as many as three times following the second treatment, but three required three treatments, and these were also positive after the third treatment. It is possible that the amebae were lodged in sites where the drug could not penetrate, and it is also possible that these individuals gave false statements relative to the taking of the drug.

FACTORS INVOLVED IN THE SPREAD OF ENDAMOEBA HISTOLYTICA INFECTION IN BARROW AND WALTON COUNTIES

Although water has been long considered as the chief factor in the spread of amebic dysentery throughout the world, a fact which is only too well illustrated in the Chicago outbreak, there is, however, little direct evidence that it played any considerable role in the spread of *Endamoeba histolytica* infection in northeast Georgia, beyond the fact that two of the cases admitted having drunk water from surface streams.

The high intra-familial rate in the 69 families studied, where the infection was 55.9 per cent, very strongly suggests that important sources of infection occur within the family after it is once introduced, and of course in some instances the intra-familial carriers may play a role in the contamination of the surface wells used almost universally throughout the area. However, a number of workers, including Craig[15], most recently have emphasized the importance of intra-familial spread by food-handler carriers in areas where neighborhood sanitation is satisfactory. Again, in the words of Craig[16]:

> "Food handlers in our hotels, restaurants, lunch counters, roadside refreshment stands and other places where food is handled and sold are the chief sources of amebic infection in well-sanitated towns and cities in the United States."

The writer is of the opinion that in addition to the intra-familial food-handler, and possibly water in some instances, another factor was responsible in the spread of *Endamoeba histolytica* infection, namely, the contamination of food by flies. It is realized that strong differences of opinion exist relative to the role played by flies in the spread of diseases of the gastro-intestinal tract. And, while at times in former years flies were incriminated more than they should possibly have been in the spread of disease, it appears that the pendulum has swung much too far in the opposite direction, and by some the fly is no longer considered an important source of infection.

However, with reference to *Endamoeba histolytica* infection, there is ample authentic evidence to indicate that flies may play an important role in its spread, as shown by Thomson and Thomson[17], who found cysts in their alimentary tracts and dejecta, and by Wenyon and O'Connor[18], who affirmed that viable cysts were recovered from the droppings of flies as long as sixteen hours after they were fed upon feces containing cysts of the parasite. Roubaud[19] duplicated this work and recovered cysts in viable form for as long as forty-eight hours after feedings. The work of Root[20] indicates that cysts may remain viable as long as forty-nine hours in the body of the fly, but if flies were drowned in water, cysts in their bodies remained viable for as long as seven days. Wenyon and O'Connor[21] demonstrated the cysts in flies caught in the wild and Frye and Meleney[22] found cysts in the alimentary tract of flies in four of twelve houses where *Endamoeba histolytica* carriers lived.

With reference to outbreaks of amebic dysentery caused by flies, Craig[23] recounts at length the outbreak at El Paso, which he observed among troops serving upon the Mexican border in 1917. He concludes that the "most of the cases received their infection from food contaminated by the droppings of myriads of flies that continually swarmed the camps and continually contaminated all exposed food," emphasizing the fact that food-handlers played little part in this outbreak because of previous examinations for the detection of carriers among this group.

With reference to extra-familial spread in Barrow and Walton Counties, it is believed that flies played an important role in many instances. Reference has already been made to the white ex-soldiers, the colored woman and the two white women in the formation of a possible chronological chain which might have been responsible for the introduction of the disease into Bethlehem. The fact remains that there were social barriers which precluded social contact, and the possibility of water and food-handlers was considered, but ruled out as epidemiologically insignificant with reference to these cases. At least two other instances are recalled where similar conditions existed and where the only important factor in the spread of the disease was found to be the nearness of the residences and the possible spread by flies, which were observed in great numbers in these homes.

In conclusion, it is believed that in addition to spread through polluted water and the con-

tamination of food by food-handlers, the role of flies in the spread of this disease is important in poorly sanitated areas. It is also believed, in such areas, that the detection of carriers and their subsequent treatment, along with the improvement of sanitary conditions, offers a satisfactory means of control of amebic dysentery, as we believe it has been accomplished to a marked degree at Bethlehem. The same also applies to those restricted families in our group throughout Barrow and Walton Counties, but with reference to the latter, neighborhood sanitation is generally poor, and it is doubtful that the corrective measures will prove as effectual or permanent as at Bethlehem.

REFERENCES

1. Walker, E. L.; and Sillards: Philippine Jour. Sci., **8**:253, 1913.
2. Sistrunk, W. E.: J.A.M.A., **57**:1507, 1911.
3. Giffin, H. Z.: J.A.M.A., **61**:675, 1913.
4. Magath, T. B.; and Ward: Amer. Jour. Hyg., **8**:840, 1928.
5. Meleney, H. E.: Jour. Parasitol., **16**:146, 1930.
6. Meleney, Bishop and Leathers: Amer. Jour. Hyg., **16**:523, 1932.
7. Craig, C. F.: J.A.M.A., **98**:1615, 1932.
8. Craig, C. F.: Amebiasis and Amebic Dysentery, p. 45. Charles Thomas.
9. Supra, p. 63.
10. Faust, E. C.: Amer. Jour. Pediat., **2**:53, 1933.
11. Strong, R. S.: Osler and McRae, Modern Medicine, **2**:221, 1925.
12. Simon, S. K.: Tice, Practice of Medicine, **4**:271, 1920.
13. Tao, S. M.: National Med. Jour. of China, **17**:412, 1931.
14. Craig, Charles F.: Amebiasis and Amebic Dysentery, p. 284.
15. Craig, Charles F.: Amer. Jour. Pub. Health, **25**:284, 1234, 1935.
16. Supra, 1235.
17. Thomson, D.; and Thomson: Jour. Roy. Army Med. Corps, **27**:1, 1916.
18. Wenyon, C. M.; and O'Connor: Human Intestinal Protozoa in the Near East, 1917.
19. Roubad, E.: Bull. Soc. Path. Exot., **11**:166, 1918.
20. Root, F. M.: Amer. Jour. Hyg., **1**:131, 1921.
21. Wenyon, C. M.; and O'Connor: Human Intestinal Protozoa in the Near East, 1917.
22. Frye, W. W.; and Meleney, H. E.: Amer. Jour. Hyg., **16**: 729, 1932.
23. Craig, Chas. F.: Amebiasis and Amebic Dysentery, p. 56.

DISCUSSION (*Abstract*)

Dr. Charles F. Craig, New Orleans, La.—This is to my knowledge the first actual survey of rural communities attempted by a state health department as to the incidence of the occurrence of *Endamoeba histolytica* in the population, with the exception of that made by Meleney, Bishop and Leathers in 1931 for the Tennessee State Department of Health. It is also the first paper to my knowledge which goes beyond survey procedures to the establishment of effective control measures in the rural areas surveyed, particularly in the town of Bethlehem. It is regrettable that many health departments regard such surveys as impracticable and for this reason have neglected a very important public health problem. Dr. Seckinger has demonstrated that they are practicable and that control methods may be established, and he has pointed out the way to others who may desire to follow in his footsteps. The most valuable conclusion to be drawn from his work is that surveys for amebiasis are easily within the resources of a state health department and that the data to be obtained have not only a very great scientific value, but also a still greater practical value from the point of view of control of the disease.

Time does not allow of a proper review of his findings, but I desire to emphasize the importance of the data regarding familial infections with this ameba. It has long been known that if one member of a family is found infected with this parasite, others in the same family are generally infected. The data presented by Dr. Seckinger are striking in that of a total of 69 families containing 290 individuals, no less than 162, or 55.9 per cent, were found to be infected with *Endamoeba histolytica*. Certainly such data demonstrate the importance of familial infection and of the public health importance of amebiasis in this country. Thus, in one family, containing 11 members, no less than 10 were found to be infected and of these 6 presented symptoms of the disease, one suffering at the time of the survey from amebic dysentery.

It has sometimes been urged against surveys for amebiasis the supposed impossibility of treating properly those found to be infected because of the cost of treatment. Dr. Seckinger has shown that this objection can be met in some localities, for those found infected in his survey were successfully treated at comparatively small cost. It is also demonstrated that the discovery and treatment of infections, together with the enforcement of sanitary regulations, resulted in the control of the infection, thus proving the practical utility of surveys for *Endamoeba histolytica*.

I am in agreement with Dr. Seckinger that in certain regions where flies are abundant a considerable amount of infection may be due to the ingestion of food contaminated by these insects. However, such a method of transmission is certainly secondary in importance to transmission through food handlers or a contaminated water supply in most localities.

For many years I have urged that amebiasis is a public health problem of much importance in this country and that it is one that is almost universally neglected by public health officers, largely because of the opinion that it is economically impossible to do very much toward the recognition of the infection and the proper treatment of those found to be infected. This survey by Dr. Seckinger amply demonstrates the public health importance of amebiasis, that it is possible to conduct surveys for this infection as a public health measure, and that the discovery and treatment of the infections, together with proper sanitary precautions, will control the condition in rural communities.

Dr. Seckinger (closing).—I wish to emphasize one point in the epidemiology of *Endamoeba histolytica* infection. There seems to be little doubt that in rural areas it spreads intra-familially and extra-familially in much the same manner as typhoid fever or bacillary dysentery, and that comparable methods of control may be effectively employed, such as the purification of water supplies and the improvement of hygienic and sanitary conditions. These methods, in addition to the effective treating of cases and carriers, should prove effective control methods, a matter which is assuming greater importance the more we learn about the disease.

THE NERVOUS CONTROL OF THE CORONARY CIRCULATION AND ITS CLINICAL SIGNIFICANCE*

By CHAS. W. GREENE, PH.D.
Columbia, Missouri

In the mortality tables cardiac disease stands at the head of the list. Cardiac malnutrition in the broadest sense is at the foundation of cardiac disease and the resulting deaths. The coronary vessels, including the thebesian veins and sinusoids, represent the mechanism for nutrition of the heart. Of these the coronary arteries have the capacity for regulative control. Without pausing to review structural features, I wish to give the whole time allotted to me to the consideration of the most recent experimental evidence of functional control of the coronary vessels, and through them of the nutrition of the heart.

In the nineties it was current teaching that the blood vessels of the heart were purely passive in so far as circulatory volume capacities were concerned. Within that decade it was demonstrated that the coronary blood vessels are fully supplied with efferent neurons of both the coronary constrictor and the coronary dilator type. Henry Newell Martin,[1] of Baltimore, in 1891, observed with a lens that coronary dilatation occurred upon electrical stimulation of the vagus, a reaction we now know to be of the cervical sympathetic which lies within the common sheath of the vagus in the dog. Porter,[2] in 1896, by the method of opening a coronary vein, observed a decrease in blood flow indicating coronary constriction upon stimulating the vagus trunk, which is a true and correct observation. In 1899, Maass[3] re-discovered and mapped the general course of the coronary dilator pathway from the thoracic cord through the stellate ganglion and inferior cervical ganglion to the heart. He also re-demonstrated vasoconstriction through nerves in the vagus pathway.

Unfortunately, human coronaries are not experimentally available. Physiologists must rely on laboratory and domestic animals for demonstration materials in this field. Dogs, cats, sheep, goats, calves, and monkeys have been used. Several of these animals have been experimented on in my laboratory. My chief source of material, however, is based on meticulous studies of the nerve control of the coronaries in the dog. We have not adequate time for extensive details, but illustrations in the form of slides, representing the actual experiments, are the medium through which I present to you the total story.

Anyone who experiments on the coronary vessels must realize that anatomical information regarding neuronal composition, and pathways of cardiac nerves in general, and of coronary nerves in particular, is inadequately demonstrated and even more poorly described in the literature. We have reexamined the whole problem of efferent neurons linking the central nervous system with the coronary blood vessels. Out of this work, as applied to the dog, have come results represented in the following summary:

(a) The coronary blood vessels react delicately to efferent dilator nerves. In response to electrical stimulation of the major efferent paths the vessels dilate 20, 40, even more than 100 per cent in carrying capacity. The reaction is very sensitive and often surprisingly great in volume.

(b) The main nerve channel as between the central nervous system and the coronary vessels is represented by the white rami of the first four or five dorsal spinal nerves and the corresponding sympathetic chain ganglia. These neurons are converged through the first thoracic (the fusion of the first two or three thoracic ganglia in the dog is known as the stellate) and the inferior cervical ganglion. Through the stellate and the inferior cervical ganglion the major portion of the dilator neurons find their way to the coronaries.

(c) Two striking additions have been made to this information by my own experiments. One is the discovery that dilator pathways extend in the sympathetic system to nerve regions above, that is, cephalad to the inferior cervical ganglion. These nerves seem in some dogs to extend as high as the superior cervical ganglion. But in other dogs the distribution of these high loops in the sympathetic nervous system is

---

*Read in General Clinical Session, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

*From the Department of Physiology, University of Missouri School of Medicine.

*We acknowledge liberal grants in partial support of the expenses of this investigation from the Therapeutic Research Committee, Council on Pharmacy and Chemistry, of the American Medical Association.

through microscopic cords of sympathetic cells lying between the strands of fibers in the lower cervical sympathetic, in the usual region of the middle cervical ganglion. It so happens that the dog seldom has a palpable middle cervical ganglion. Nevertheless, we have demonstrated microscopically a diffuse distribution of ganglionic cells in the corresponding position. This diffuse arrangement of cell bodies is a region of pre-postganglionic synapses for the dilator pathway.

(d) A second deviation from the general efferent pathway of great significance is in the fact that certain of the thoracic ganglia give rise to small nerve branches which we have demonstrated to carry coronary dilator fibers. These nerves are derived from the fifth and sixth thoracic ganglia, run to the mediastinum and reach the heart by that pathway. These are the nerves which in the hands of Ionesco,[4] in 1927, in Danielopolu's laboratory of Budapest, were shown to contain cardiac accelerator fibers. Undoubtedly these nerves belong to the group which Cannon,[5] (1926), has shown must be destroyed adequately to denervate a heart from rate control. We have shown that the thoracic nerves also carry coronary dilator fibers.

Summarizing these observations reveals that in the dog the efferent dilator nerves from the central nervous system and spinal cord cover a wide spread in the sympathetic ganglionic chain, as between the superior cervical ganglion and at least the sixth dorsal ganglion. Surgeons who interfere with the cervical sympathetic trunk, or any of its ganglia from the superior cervical to the sixth thoracic, must take into consideration the fact that they are interfering, not only with important augmentary nerves controlling cardiac rate and force, but they also interfere with the great dilator mechanism of the coronaries themselves. It is by these nerve paths that immediate and active coronary dilatation is accomplished as the physiological answer to every acute dynamic strain set up by an increase in cardiomotor work. Without the coronary dilatation an increase in cardiac work is self-limited.

Efferent Coronary Constrictor Pathways.—Various degrees of emphasis have been placed by different investigators on the volume and distribution of the coronary constrictor neurons, and the pathway of distribution to the cardiac vessels. Porter[2] makes the statement that they are in the vagus. He infers that they are in the vagus, since when he stimulated the cervical vago-sympathetic trunk in the cat, he obtained coronary constriction, just as Newell Martin,[1] by the same method and by stimulation of the same nerve complex, observed coronary dilatation. It now turns out that Porter was right in his assumption. But Martin was wrong when he explained the coronary dilatation which he observed by assuming dilator neurons in the vagus nerve. These coronary dilators are in fact constituents of the cervical sympathetic trunk, bound in the dog on which Martin experimented in the common sheath with the vagus trunk.

Operative Demonstration of Coronary Constrictor Neurons in the Vagus.—It seemed that the question of neuronal composition could easily be determined by the method of producing degeneration of the efferent neurons of the cervical vagus trunk. This method was successfully applied, namely, sectioning of the vagus trunk central to the ganglion nodosum.

Following this operation, and a sufficient time for nerve degeneration, experimental stimulation of the cervical vago-sympathetic no longer produces cardiac inhibition, an unquestioned check on the degenerative loss of function of well-known neurons. Nor does it produce coronary constriction, which is the major observation sought. Stimulation of the cervical vago-sympathetic trunk after degeneration of the vagus proper either produces no coronary change, or more often induces a definite coronary dilatation which must be ascribed to the cervical sympathetic.

The latter reaction is not a vagus reaction, but a cervical sympathetic reaction, and is explained by the fact that coronary dilator neurons in the cervical sympathetic trunk are undisturbed by the technic of cutting and degenerating the vagus trunk. Stimulation of these cervical neurons produces active coronary dilatation.

It so happens that in the dog the mass of cervical sympathetic fibers, even in the normal animal, often exceeds the mass of constrictor fibers in the vagus. When this type of animal is tested the sum of the stimulation of the two opposite nerves is coronary dilatation. That is my understanding of the difficulties encountered by those investigators who have raised this question.

Reflex Control of the Coronary Blood Vessels as a Measure of Normal Functional Coordination.—I trust that my audience will appreciate what has seemed to be an unnecessarily long and detailed description of the efferent coronary nerve mechanisms. We have hoped that it would be so clearly visualized that the information can be used at once in understanding the much more complicated set of reflex mechanisms of coordinative coronary control that exist throughout the body. When the whole physiological picture is before us we recognize at once that the efferent organ-controlling neurons are merely the terminal channels for securing coordination as between the heart and regions executing acute physiological changes. We are all familiar with numerous physiological conditions in which the adjustments of cardiac rate seem immediate and spontaneous, adjustments to position, to a change in motor activity, to excitement, to any kind of stimulation, either internal or external, that affects some part of the body during the vicissitudes of every day life. These adjustments of cardiac rate are a matter of common knowledge and are taken for granted. Nevertheless, we never have the reaction of adjustment of rate except through the operation of autonomic reflex mechanisms. Reflexes start in definite peripheral sensory stimulations and terminate in efferent autonomic disturbances of either motor or inhibitory influence on the myocardium and the heart as a whole.

It is equally true of the delicacy of control of the coronary blood vessels and of the volume of flow of the blood through the vascular channels of the myocardium itself. If I should run rapidly across the platform and back there would occur a quick acceleration in heart rate to that sudden activity, and the minute-volume of the heart would decidedly increase. In a word, there is an instantaneous reflex coordination of the factor of cardiac work with the intensified body motor activity. It is equally true that there is a corresponding reflex dilatation taking place in the coronary blood vessels whereby the volume of coronary blood flow through the cardiac muscular walls is increased proportionately to the greater work of the heart.

I have secured this evidence by a systematic examination of typical regions of the body for the type of reflex response in the coronary vessels to afferent stimulations in these regions.

Sciatic Coronary Reflexes.—The most striking of all the experiments of this class has been the effect of stimulating the great somatic nerve, the sciatic. Sectioning this nerve and stimulating the central end, so as to involve only afferent neurons, produces a profound reflex coronary dilatation. Numerous experiments have demonstrated that the coronary increase in flow may be 30 to 60 per cent, or more, and that the latency of the whole reaction is essentially that of an ordinary vasomotor reflex.

This is only part of the story. Afferent stimulation of such channels as the sciatic sometimes produces a later coronary constriction. Coronary dilatation is the primary and initial reaction and constriction is a delayed reaction that follows. The reflex dilatation is much more pronounced and may be the only response. Nevertheless, it occasionally happens that there is this diphasic or double response. If one accepts the general deduction without elaborate review of the data, the conclusion may be drawn at once, namely: that in somatic trunks, such as the sciatic, there are afferent fibers so connected in the nerve centers of the brain stem and the cord as to bring about either type of vascular reflex in the coronaries. In short, the coronaries are under double reflex control. Such reactions are well enough known in systemic blood vessels, but this is a new demonstration for the coronaries.

Afferent Visceral Pathways.—We have used three type regions of visceral afferent pathways: abdominal splanchnic, thoracic vagal, and thoracic phrenics. In each of these pathways afferent, that is centrally conducted, nerve impulses produce coronary reflexes. In each of these the primary reaction is coronary dilatation. Although the greater reaction is coronary dilatation, nevertheless in the splanchnic and in the vagal paths a degree of reflex coronary constriction may also occur in sequence with the dilatation.

The phrenic, which has a comparatively large number of afferent neurons reflexly affecting chiefly pulmonary conditions, possesses afferent neurons which occasionally induce reflex coronary dilatations of no mean proportions.

Summarizing this evidence for reflex control, one may make the following statements:

(1) Reflex coronary control follows sensory stimulation in all the great somatic and visceral regions.

(2) The reflex reaction is always a primary coronary dilatation.

(3) Coronary constriction may also be in-

duced reflexly by afferent stimulation of either somatic or visceral sensory structures.

(4) A comparison of the coronary dilator reflexes with constrictor reflexes indicates that the former are by far the more sensitive. They are much greater in volume and are in fact the dominant reactions.

Some General Deductions in Review of the Nature of Reflex Coronary Control.—Consideration of the flow of blood through the coronary arteries raises several questions of great general significance. One of these is the relative volume per unit of myocardial mass of coronary blood flow per minute. Starling has indicated that this volume is ordinarily not far from 1 c. c. per minute per gram of cardiac tissue. However, under conditions of greatly increased heart activity we have data indicating that this volume may be augmented to as much as 2 or 3 c. c. per gram, in short, a three-fold increase. Cotton, Rapport and Lewis[6] (1917) have already called attention to the very close proportional relation of the increase in cardiac minute-volume output with increase in body work. These authors were emphasizing the autonomic control that reacts to increase the heart work in reflex coordination with an increase in body work, functions that run closely parallel courses.

My data contain illustrations not yet published that point to a more or less parallel increase in coronary flow with cardiac work. We are of the opinion that the increase in coronary flow is not an expression of any direct causal relation between coronary reaction and cardiac work. It is an independent reflex response to the conditions in other parts of the body which also stimulate the increase in cardiac work. I believe the reflexes that increase the heart work and reflexes of coronary dilation are mediated by independent reflex arcs having their sensory connections in the same field. Some of the afferent paths from the peripheral region are by way of afferent neurons associated with cardiac motor centers, while other neurons in the same gross anatomical nerve trunks react through reflex centers which control the coronary blood vessels. In other words, these are closely associated but not identical reflexes.

Acute changes affecting the work of the heart are obviously and primarily augmentary. In fact, the presence of an inhibitor mechanism in the mammalian heart is essentially a late phylogenetic development of a protecting biological mechanism against overactivity of the cardiac motor mechanism. Of these the carotid sinus organ is a splendid example.

By the same logic and in view of the demonstrated reflex types of reaction, the view seems logical that coronary dilatation is the primary reflex reaction affecting these vessels. In a healthy, adult, and well developed heart, beating under the control of all the delicate physiological autonomic nerve mechanisms, the acute strains are all, or essentially all, in the direction of increased activity. In so far as the coronary system is concerned, the myocardial strains are met by an increase in reflex coronary dilatation. This response supplies the acute increase in volume of oxygen and of nutritive constituents of the blood whereby the more active myocardium continues to operate in a normal and effective way.

Coronary constriction has seemed to me to be of less and less value as a protective mechanism. The chief and outstanding physiological reaction is the coronary dilatation. This dilatation cannot be over-emphasized.

Physiological Loss of Power of Coronary Dilatation.—Holding in mind the facts just reviewed, attention is invited to what may happen in a pathological heart and its cardiac vascular mechanism. The very foundational condition for delicate reflex control of the blood flow through the vessels of the heart assumes a resilient set of arteries, sensitive muscular walls, normal neuronal connections, properly functioning through the basic reflex pathways of the central nervous system. In infection, or degeneration, or pathological process of any kind affecting the cardiac vessels the tendency of such a process is damage with retrogression of tissues. In advanced sclerosis, for example, the coronary muscles are degenerated, at least in part. They are suddenly less resilient, the supporting tissues are less elastic, and the whole coronary vessel becomes more rigid, less sensitive; in short, a non-responsive vascular tube. Under such conditions it is observed that the delicacy of reflex controls will have been lost in proportion to the degree of the damaging process. Pathology, therefore, tends to reduce the physiological volume and efficiency of reflex coronary dilatations and sets up a foreshortened limit for coordinating functional reflex adjustments.

In the meantime cardiac motor mechanisms which do not run parallel courses of degeneration may drive the heart to a greatly increased activity to which the coronary control cannot follow in adequate response. The net result is

prompt and acute cardiac asphyxiation. Such an explanation is much more rational for the cardiac distress observed upon an increase of muscular exertion, or following meals, or at times of mental, that is, emotional excitement,* than the alternative concept of coronary constrictor spasm which has been used to explain these clinical symptoms.

Spasms of coronary vasoconstriction have, since the time of Heberding, been assumed to explain the myocardial asphyxiation resulting in the pain and distress of anginal attacks. These are of the anginal functional type. The experimental work on the dog compels one to accept the possibility that an over-developed coronary constrictor mechanism, coupled with a sensitive sympathetic nervous system, may result in a reflex spasm with reduction of the coronary blood flow. This possibility cannot be denied. Nevertheless, animal experimentation with continuous measurements of variation in coronary flow, both of reflex type and to direct efferent nerve stimulation, indicate that a majority of the clinical anginas can be more rationally explained on the assumption of loss of resilience in the reflexes of diseased arteries. In short, the nerve control of the rate and minute-volume of the diseased heart may still be present and capable of vigorous functional reactivity to conditions of normal stimulation in hearts which have lost corresponding reactive resilience in their blood vessels. Reflexes may produce increased work without the normal coincident response of acute coronary dilatations to supply an adequate increase in blood and oxygen. Asphyxiation occurs just as effectively under these conditions as under hypersensitive coronary constrictions that reflexly cut off the blood supply. No doubt it is presumptuous on my part to suggest the possible clinical significance here, but in so far as a physiologist may emphasize the logical significance of experimental facts and draw conclusions from animal experimentation, it would seem a safe hypothesis that anginal attacks are brought on by the negative failure of coronary dilatation establishing asphyxiation far oftener than by functional coronary over-constriction. This view was announced before the annual meeting of the Missouri State Medical Association in 1931,[7] and while not strictly a new concept, the theory has received experimental support in my laboratory (1935), which justifies stronger emphasis as a concept of great clinical import.[8 9 10]

Reactions have been measured by the method of Morawitz and Zahn (1912) of draining off the flow of blood from the coronary sinus and interpreting the variations in flow as an index of dilatation or constriction of that portion of the coronary bed returning blood by this channel. The flow has been measured and recorded continuously by an accurately ground cylindrical manometer developed for this research. Passive effects of arterial pressure variations of extracardial origin have been ruled out by a pressure equalizing device. Recently Jochim, Bohning, Rottersman and Gralnick,[12] from Katz' laboratory, have emphasized the necessity for measuring the inflow into the coronary arteries as the more accurate and logical procedure. Further experimentation will doubtless develop the inherent errors and refine the coronary methods. We have confidence in the conclusions drawn from the data revealed by the coronary sinus method. The present manometric method of recording reveals results which may be summarized as follows:

*It is interesting that today two of my friends reported the symptoms of anginal attacks while listening over the radio to the intercollegiate football contest.

SUMMARY

The several hundred animal experiments, complicated and laborious in character, with many features of reactive conditions to be properly interpreted, have revealed results which, when tabulated, can be summarized in a few terse statements.

(1) The coronary blood vessels are richly supplied with efferent neurons of both coronary dilator and coronary constrictor type. Of these, the coronary dilator neurons are greater in mass effect, more definite in physiological control, and must obviously serve the primary function of increasing the coronary flow during augmented myocardial work.

(2) Coronary constrictor mechanisms, on the other hand, are more limited, the reaction is less voluminous, but in extreme development this portion of the cardiac mechanism may play an important part in producing attacks of functional angina.

(3) The new concept, which I most wish to stress, is that these two great coronary nerve mechanisms are delicately controlled by very definite and specific reflex nervous mechanisms in adaptation to every delicate changing activity of the whole body. These reflexes are primarily coronary dilator in type; nevertheless, there may occur associated reflex coronary constrictions.

(4) In pathology of the myocardium, and especially of the coronary vessels, structural changes inevitably reduce physiological resilience and delicacy of adaptive response. Under conditions in which the normal animal reacts by increases in the coronary circulation corresponding to the increase in myocardial work, the pathological heart cannot give the corresponding dilatations of the coronary arterial system. Hence there is failure of adequate coronary blood flow, and cardiac asphyxiation follows. Oxygen want is induced with the resulting spasms of pain.

(5) Of the two processes which can induce anginal attacks, the over-functional activity of the reflex coronary constrictor mechanisms seems to be of lesser significance than the blocking of functional dilatations by pathology of the vessel walls.

BIBLIOGRAPHY

1. Martin, Henry Newell: Trans. Med. Chir. Fac. of Maryland, pp. 291-294, 1891.
2. Porter, W. T.: Boston Med. and Surg. Jour., **39**:134-135, 1896.
3. Maass, Paul: Arch. f. d. ges. Physiol., **74**:281-304, 1899.
4. Ionesco, D.; and Enachesco, M.: Compt. rend. Soc. de biol., **97**:977-980, 1927.
5. Cannon, W. B.; Lewis, J. T.; and Britton, S. W.: Amer. Jour. Physiol., **77**:326-331, 1926.
6. Cotton, T. F.; Rapport, D. L.; and Lewis, Thos: Heart, **6**:269-284, 1917.
7. Greene, C. W.: Jour. Mo. State Med. Assn., **28**:466-469, 1931.
8. Greene, C. W.: Amer. Jour. Physiol., **113**:361-383, 1935.
9. Greene, C. W.: Amer. Jour. Physiol., **113**:399-415, 1935.
10. Greene, C. W.: Amer. Heart Jour., **11**:—, 1936 (in press).
11. Morawitz, P.; and Zahn, A.: Zentr. f. Physiol., **26**:465-470, 1912; Deutsches Archiv. f. Klin. Med., **116**:364-408, 1914.
12. Jochim, Kenneth; Bohning, Anne; Rottersman, Wm.; and Gralnick, Alexander: Proc. Amer. Physiol. Soc., Amer. Jour. Physiol., **113**:71, 1935.

RECENT ADVANCES IN DIAGNOSIS AND TREATMENT OF CORONARY THROMBOSIS*

By LOUIS FAUGERES BISHOP, JR., M.D.
New York, New York

The advance in our frontier of knowledge of coronary thrombosis has been a gradual process. Most of our progress has not been the result of new discoveries, but simply a more thorough and intimate appreciation of things which we have known a long time in outline, but whose many ramifications we have not thoroughly appreciated. The situation is not unlike the individual who looks at stereoscopic films of the chest for the first time. He sees in only two dimensions. He continues to look and finally the stereoscopic, visual sensation comes to him. Nothing in the films themselves has changed, but a great deal has taken place in his view and understanding of them.

Aside from this general increase in our familiarity with the subject there have been in addition within the past decade many distinctly new discoveries, but most of these are associated with the technicalities of the electrocardiograph, which do not lend themselves to detailed description before a general meeting such as this.

In anticipation of this address I have again reviewed the literature and, in conjunction with my own experience, have attempted to digest for you the conspicuous elements in the progress of our knowledge during the past decade. Needless to say, the vastness of the subject precludes detailed references. I will, therefore, refer to the important work only superficially and urge your more careful perusal of the original material.

By briefly reviewing for you these main landmarks it is my hope to be able to enrich your familiarity with and understanding of this interesting condition.

The term, coronary thrombosis, by common usage has attained a wide connotation unrelated to the precise pathology the term attempts to describe. I shall not burden you by quibbling over the inaccuracy of this term, and will ask your indulgence in allowing me to use it loosely in this discussion, including under this head all forms of obliterative coronary disease.

For the sake of simplicity in presentation I have divided the subject of this discussion into four headings and should like to consider them in the order named:

(1) Advances in knowledge of symptomatology and clinical differential diagnosis.

(2) Advances in knowledge of clinical pathology with reference to diagnosis and treatment.

(3) Progress in electrocardiographic interpretation.

(4) What we have gained with reference to treatment, management and prognosis from all this.

SYMPTOMATOLOGY AND CLINICAL DIFFERENTIAL DIAGNOSIS

When coronary thrombosis was thought to occur only in individuals in the fifth and sixth decade, the problem of differential diagnosis was not so complicated as it is today. We

*Read in General Clinical Session, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

now know that the disease not infrequently occurs in the fourth decade, and rarely in the third, as was recently and convincingly demonstrated by Levy, Bruenn and Kurtz[1] in a statistical analysis of over 2,800 autopsies at the Presbyterian Hospital. I have myself just recently seen an example of acute coronary occlusion in a man of 34. Since we are finding it with increasing frequency in the earlier age groups, the problem of differentiating it from other acute conditions prevalent in these groups has gained in interest and importance. That this is a fairly general feeling among men in this field of work is evidenced by the amount of material published recently on the differential diagnosis of coronary thrombosis.

There are a number of conditions in the chest and in the abdomen which may give rise to diagnostic difficulty. Occasionally, the differentiation is exceedingly difficult, but usually the primary error is in not thinking of other possible conditions, so that we shall simply mention categorically the more important of the conditions to be differentiated. These are, above the diaphragm: angina pectoris, pneumonia, pulmonary embolism, luetic aortitis with aneurysm of the aorta, dissecting aneurysm of the aorta, pericarditis, herpes zoster, intercostal neuralgia, spontaneous pneumothorax, and interstitial emphysema of the lungs.

Then there is a second group in which abdominal disease has confused the picture: appendicitis, gallbladder disease, cancer of the stomach, nervous dyspepsia, ruptured peptic ulcer, mesenteric thrombosis, acute pancreatitis, tabetic crisis, diabetic acidosis, esophageal hiatus hernia.[2 3 4] To illustrate this categorical list one could, if time permitted, cite numerous instances of an intensely dramatic nature. To mention only one: I recently saw an active surgeon who was told that he had coronary thrombosis. A rather searching cardiological examination failed to support this diagnosis, but the answer came in a roentgen film of the abdomen showing numerous stones in the gallbladder.

Probably the most important advance in knowledge of symptomatology has been in the diagnosis of the milder type. Here the occlusions are frequently of the smaller vessels. The symptomatology of the attacks is often strikingly atypical. There may be unusual pain radiation, or symptoms of dyspepsia, or occasionally syncope without pain at all. These, consequently, all too frequently, are diagnosed as angina pectoris or acute indigestion, and treated by nitroglycerine or sodium bicarbonate, and allowed the pursuit of their daily activities. Smith and Saul,[5] in a recent report, emphasize the difficulty of recognizing these atypical syndromes. This fall I saw an individual in whom this point was very clearly illustrated. Repeated attacks of anginal pain were promptly relieved by nitroglycerine. There were no changes in blood pressure, pulse rate, temperature or leukocyte count. But serial electrocardiograms showed a gradual change significant of a progressive coronary occlusion.

Diligent efforts along the lines to be outlined in this paper should help us to detect these earlier and milder types in which the prognosis is extremely favorable under proper therapy, thus protecting them from the severer types of coronary accident for which they are most certainly candidates if allowed to continue untreated.

CLINICAL PATHOLOGY

As an aid to diagnosis as well as to prognosis and management, we have two laboratory procedures: (1) the leukocyte count, (2) the red cell sedimentation rate.

Although the early observation was made that the leukocyte count rose in acute coronary thrombosis, it remained for later investigators to note that this leukocytosis developed as early as an hour after the onset of symptoms; and that should a high leukocyte count persist, it would suggest a progressive destruction of the heart muscle; and finally, that this count, if followed closely, was a more important criterion of prognosis and management than fever.[6]

Just as the leukocyte count has proven itself to be a more sensitive index of the progress of a myomalacia than the temperature, so has it recently been shown that the red cell sedimentation rate is a more sensitive index than either temperature or leukocyte count.[7 8] When the leukocyte count has returned to normal the red cell sedimentation rate may still show that the process has not yet subsided. This increased sedimentation rate does not appear until two or three days after the accident, but it persists sometimes weeks after the fever and leukocytosis have disappeared. This is of value to us not only in gauging the length of treatment in obvious cases of coronary thrombosis, but it is a distinct aid in the diagnosis of the milder types. It must be remembered that this test has definite limitations, and that before attempting it one must rule out all active infec-

tions which would invariably induce an elevated rate. Shookoff, who has done a great deal of work on the sedimentation rate in coronary thrombosis, writes me that he has found this test of inestimable value in the diagnosis of coronary thrombosis at a time when the leukocytosis and temperature have returned to normal in patients with a history of a recent anginal attack.

ELECTROCARDIOGRAPHY

One approaches with a good deal of temerity our next topic. When one speaks of electrocardiography before a general meeting such as this, it is difficult to know where to begin and where to stop. Out of all the work that has been done during the past few years on coronary thrombosis, certainly the work of the electrocardiographer has been the most enlightening.

It is impossible to review or even to summarize the extent of this work in the time allotted. But here again if I can review for you what I feel to be the main landmarks, and refer those of you who are interested to their more detailed and elaborate discussion, I may be able to add something of practical value to your present knowledge of the subject.

The first landmark came of course with the description by Herrick,[9] Smith,[10 11 12] and Pardee[13] of the T-wave changes associated with coronary thrombosis. Following this we became so intensely concentrated on T-wave changes that we forgot all the other deflections of the electrocardiogram, but finally the pendulum began to swing back, first, with the description by Wilson[14] in 1926 of the Q-wave changes, subsequently elaborated by Pardee[15] and confirmed by many others, and now fairly well established; later with the description of the S-wave changes by Winternitz[16] in 1931; and finally with the questionable significance of P-wave changes by Master[17] in 1933, which still requires further confirmation. So that we now are obliged to consider the graph as a whole rather than any one particular deflection. Such in brief is the development of knowledge of coronary thrombosis as manifested in the three conventional leads of the electrocardiogram. It still can be said that the great majority of thrombosis episodes will leave their label on the first three leads, particularly if serial graphs are taken and compared, but there are a small group of very important examples which will not show up in the conventional leads, but will manifest themselves in the precordial leads. The reason I say these examples are important is that they are frequently atypical clinically, involving small lesions in which, of course, proper therapy following an early diagnosis can often give us gratifying results.

In addition to enabling us to recognize these early and atypical types, the precordial leads frequently corroborate findings in the conventional leads which, without this confirmatory evidence, we could regard only with suspicion. Finally in support of the precordial leads, it should be said that they do encourage us to go back and analyze more critically our conventional leads.

You might well ask what is meant by precordial leads. I have purposely remained vague so far because what I have just said about the precordial leads is fairly sound and well accepted, while attempts to be more specific introduce much dispute and speculation. However, out of a cauldron of material on the subject, Roth seems to have extracted a few practical, fundamental facts. First, he points out that it is not necessary to use the 9 leads of Hyman or the 31 leads of D'Ortina in order to get most of the information which precordial leads can give us. In fact if we limit ourselves to the chest right arm lead and the chest left leg lead, we cover most of the information of practical value. These are companion leads and can be checked one against the other. In the chest right arm lead the deflections are positive, as they are in the three conventional leads, and therefore subject to the same criteria of normality and abnormality which we apply to conventional leads. The graph of the chest left leg lead is almost identical to the graph of the anterior-posterior lead, or the chest back lead; it is therefore a mirror-image of the chest right arm lead, and consequently does occasionally not only reveal findings not found in the other four leads mentioned, but frequently helps us clarify our interpretation of the chest right arm leads.

Before leaving the subject of electrocardiography I am going to climb out on a limb and say a word about localization. Many investigators most intimately associated with the subject now feel that we should bury our hopes concerning localization and start all over again. They may be right! However, the amount of autopsy material and experimental work which has served to confirm localizations by electrocardiographic study still convinces me that there is something in it. Robb[19 20] has recently thrown new light on this subject by dividing the heart into

eight muscles and attempting to localize lesions according to the particular heart muscle involved. To date, the practical value of locating myocardial infarcts from the electrocardiogram has not manifested itself. But I think we should keep an open mind on the subject, attempt to localize and confirm by autopsy whenever we can, keep careful clinical records of patients in whom we thought we could localize the infarct. Perhaps the future will show us the practical value of these observations.

TREATMENT

The present status of the treatment of coronary thrombosis is not unlike that of tuberculosis before the institution of the newer surgical procedures, when the full importance of rest was emphasized. We are now just beginning to recognize the quantitative value of rest in coronary thrombosis: rest over long periods of time ranging from four to twelve weeks, and rest which is absolute in every respect, shielding the patient from every form of stimulus, mental, physical and emotional. The difference between this type of rest treatment and a more haphazard program may frequently weigh the balance between a recovery and a fatality. The late Dr. Thayer said:

> "I endeavor to keep these people in bed from one month to two or three months. After the immediate symptoms have passed, they always get regular, general massage, at least three times a week. When the time comes to sit up, progress should be extremely gradual and exercise should be taken up little by little. My patients rarely leave the hospital within a month after they begin to sit up."

Hand in hand with rest goes psychotherapy for no proper rest can be obtained when the patient is worried or apprehensive. The management of a case of coronary thrombosis in a high pressure executive is an extremely difficult problem, taxing to the utmost the ingenuity of the physician.

At the expense of repetition, I wish to emphasize the point that, although we have used bed rest for some time in coronary thrombosis, it is only recently that we have come to realize the extreme importance of a regime of absolute complete rest after an acute episode, judging the extent and duration of rest for each individual by following the patient's progress clinically and electrocardiographically, and by use of the white blood count and the sedimentation rate.

The next most important adjunct to rest is diet. Master[21 22] has recently emphasized the advisability of keeping these patients on very low calory diet. Common sense has for a long time told us that it is unwise to allow them to overload their stomachs. And here again, like rest, there is a great difference in the therapeutic result between a haphazard regime, simply advising a patient not to eat too much, and a more precise, orderly program in which by laying out his diet you make certain that he does not exceed 900 calories a day. The diet should, of course, be well balanced and if possible it should include liberal vitamins; and the studies of Wolbach and Howe on the effect of vitamin C in promoting new capillary growth suggest the desirability of forcing this vitamin in the form of fresh citrus fruits.

It is difficult to evaluate the therapeutic results of drug treatment in coronary thrombosis because the results are not unusually striking, although in certain individuals some forms of drug therapy do appear to have value.

As emergency measures drugs are, of course, at times life-saving. Morphine in large doses for the control of pain, shock and restlessness has stood the test of time as an indispensable aid in treatment. Oxygen, as an adjunct to morphine, and at times as a partial substitute, has gained a good deal of merited popularity. It is of course best administered in an oxygen chamber or an oxygen tent using a concentration of about 50 per cent, but when a chamber or tent are not available, it may be given by nasal catheter. If the catheter is inserted well into the nasopharynx and the rate of flow set at 5 to 6 liters per minute the patient should get a concentration of about 38 per cent oxygen. I have frequently had occasion to use oxygen therapy, particularly during the acute stage, and in several instances with symptomatic relief. Occasionally, where pain was unrelieved by morphine, oxygen in high concentration, 50 to 60 per cent, was effective. I agree with Barach and Levy[23] that the employment of oxygen therapy may aid in maintaining an adequate circulation until the heart has had an opportunity to recover from its acute functional disturbance.

With respect to the use of glucose in the treatment of coronary occlusion there is still considerable debate. Ardent advocates of this

substance use repeated intravenous injections of 50 per cent solution and feel that this therapy is not only of great value in acute shock, but also serves to supply the myocardium with a deficient factor which they believe has considerable bearing on the ultimate healing. Falk uses 50 c. c. of a 50 per cent solution combined with 3½ grains of caffeine sodiobenzoate every hour or two during the acute stage. Those who oppose these views feel that the drug is useful in the first injection as a treatment for shock, but find that if repeated injections are used it loses its efficacy with each additional injection and really has no fundamental effect on the myocardial reserve. Personally, I have never been able to demonstrate its efficacy to my satisfaction except as an adjunct to other supportive measures in the treatment of shock.

The time worn debate concerning the use of digitalis seems to have pretty well resolved into a fairly unified opinion, and that is, that it certainly has no value, but may have distinctly harmful effect when used in the acute stage as a routine procedure. This impression has now been recently supported by some experimental work of Bellet.[24] These qualifications apply, as I have said, to the use of digitalis as a routine procedure. In cases of fibrillation with congestive failure following thrombosis, there seems to be sufficient evidence to warrant its use.

Quinidine sulphate in doses of about 0.2 of a grain two to three times a day as a prophylactic measure against auricular or ventricular fibrillation has been recommended by a number of cardiologists.[25] In my own experience the drug is dangerous and without material benefit. In this drug the danger, even though remote, that a mural thrombus may be dislodged seems to me to contraindicate its use.

I think we are still on the fence about theobromine and allied drugs, which we use in attempting to produce a prolonged condition of coronary vasomotor dilatation. I still use it because in the first place I have never seen any harmful effects, and it may be that these drugs encourage the establishment of collateral circulation. Occasionally I have thought they were extremely useful, but of course such observations, coming as my interpretation of a patient's subjective impression, are most difficult to evaluate.

PROGNOSIS

Probably the most important advance in the past decade is the change in our concept of the prognosis of this disease. What avail improvements in diagnostic procedures and therapeutic measures if we do not reap a harvest in a better outlook for the patient?

It is interesting to observe that only seven years ago recovery from a case of coronary thrombosis was considered sufficiently unusual to warrant publication as a case report.[26]

Now it is well known that the chances of an individual's surviving the first attack are extremely good, and that life expectancy following coronary thrombosis may extend as long as seventeen years, to witness, the case of White.[27]

This improvement in prognosis should be emphasized to patients afflicted with this disease. It will do much to help dispel the deadly fear associated with the term, coronary thrombosis. The more physicians gain in this newer concept of the prognosis the more cheerful they will be in their relations with patient and family, and this should soon reflect itself in the patient's own betterment.

CONCLUSION

In summary I should like to emphasize four points which I feel are distinct advances in our knowledge of the diagnosis and treatment of coronary thrombosis. One is the importance of recognizing the symptomatic similarity of coronary disease and unrelated pathologic conditions in the chest and abdomen. The second is our ability, through the use of serial electrocardiograms, the precordial leads and the sedimentation rate, to detect atypical and milder cases and institute early therapy. The third, the importance of the use of prolonged absolute rest, low calory diet and oxygen in treatment. And finally as a result of the three other advances, we are now happily able to give a truly optimistic prognosis to those afflicted with this condition.*

REFERENCES

1. Levy, Robert L.; Bruenn, Howard G.; and Kurtz, Dorothy: Facts on Disease of the Coronary Artery, Based on the Survey of the Clinical and Pathological Records of 762 Cases. Amer. Jour. Med. Sci., **187**:376, 1934.

*Only a few of the more important references are appended for brevity's sake. A large literature was consulted for this communication.

2. Averbuck, Samuel H.: The Differentiation of Acute Coronary Artery Thrombosis from Pulmonary Embolization. Amer. Jour. Med. Sci., **187**:391, 1934.
3. Barker, P. S.; Wilson, F. N.; and Coller, F. A.: Abdominal Disease Simulating Coronary Occlusion. Amer. Jour. Med. Sci., **188**:219, 1934.
4. Ernstene, A. Carlton: The Differential Diagnosis of Coronary Artery Disease. Cleveland Clinic Quarterly (Bull.), vol. **2**, No. 4 (Oct.) 1935.
5. Smith, Carter; and Sauls, H. Cliff: Recovery from Coronary Thrombosis: Report of Eight Cases, with Particular Reference to the Recognition of the Less Severe and Atypical Types. Ann. Int. Med., **9**:317, 1935.
6. Libman, E.; and Sacks, B.: A Case Illustrating the Leukocytosis of Progressive Myocardial Necrosis Following Coronary Artery Thrombosis. Amer. Heart Jour., **2**:321, 1926-7.
7. Bickel, G.; Mozer, J.; and Scichounoff: Erythrocyte Sedimentation in Myocardial Infarction. Arch. d. Mal. du Coeur, **28**:73, 1935.
8. Shookhoff, Charles; Rabinowitz, Meyer A.; and Douglas, Albert H.: The Red Cell Sedimentation Time in Coronary Occlusion. Amer. Heart Jour., **7**:52, 1931.
9. Herrick, J. B.: Thrombosis of the Coronary Arteries. J.A.M.A., **72**:387, 1919.
10. Smith, F. M.: The Ligation of the Coronary Arteries with Electrocardiographic Study. Arch. Int. Med., **22**:8, 1918.
11. Smith, F. M.: Further Studies on the T-wave of the Electrocardiogram of the Dog Following Ligation of the Coronary Arteries. Arch. Int. Med., **25**:673, 1920.
12. Smith, F.; Rathe, H. W.; and Fowler, W. M.: The Electrocardiographic Changes Following the Ligation of the Small Branches of the Coronary Arteries of the Dog. Amer. Heart Jour., **7**:477, 1931-2.
13. Pardee, H. E. B.: Clinical Aspects of the Electrocardiogram. New York: Paul Hoeber, 1928.
14. Wilson, F. N.; MacLeod, G. A.; Barker, P. S.; Johnston, F. D.; and Klostermeyer, L. L.: The Electrocardiogram in Myocardial Infarction, with Particular Reference to the Initial Deflections of the Ventricular Complex. Heart, **16**:155, 1933.
15. Pardee, H. E. B.: The Significance of the Electrocardiogram, with Large Q-3. Arch. Int. Med., **46**:470, 1930.
16. Winternitz, Max: The Initial Complex of the Electrocardiogram After Infarction of the Human Heart. Amer. Heart Jour., **9**:616, 1934.
17. Master, Arthur M.: P-Wave Changes in Acute Coronary Artery Occlusion. Amer. Heart Jour., **8**:462, 1933.
18. Robb, Jane Sands: Evidence for Characteristic Modifications of the Electrocardiogram Produced by Lesions of the Ventricular Muscle Bands. Proc. Soc. Exper. Biol. & Med., **31**:311, 1933.
19. Robb, Jane Sands; Easby, M.; and Hiss, J. G. F.: Experimental Interference with Conduction in the Heart. Amer. Jour. Med. Sci., **188**:1835, 1934.
20. Robb, Jane Sands; Hiss, J. G.; and Robb, Fred and Robert C.: Localization of Cardiac Infarcts According to Component Ventricular Muscles. Amer. Heart Jour., **10**:287, 1935.
21. Master, Arthur M.: Coronary Artery Thrombosis, with Treatment by Prolonged Rest in Bed and Low Calory Diet; Improved Prognosis. J.A.M.A., 105:337, 1935.
22. Master, A. M.; Jaffe, H. L.; and Dack, Simon: Low Basal Metabolic Rates Obtained by Low Calory Diets in Coronary Artery Disease. Proc. Soc. Exper. Biol. & Med., **32**:779, 1935.
The Basal Metabolic Rate in a Patient with Coronary Artery Thrombosis when Placed on an 800 Calory Diet. Jour. Mt. Sinai Hosp., **1**:263, 1935.
23. Barach, Alvan L.; and Levy, Robert L.: Oxygen in Treatment of Acute Coronary Occlusion. J.A.M.A., **103**:1690, 1934.
24. Bellet, S.: Effect of Cardiac Infarction on Tolerance of Dogs to Digitalis. Arch. Int. Med., **54**:483, 1934.
25. Gold, Harry; Otto, Harold L.; and Satchwell, Harry: The Use of Quinidine in Ambulatory Patients for the Prevention of Paroxysms of Auricular Flutter and Fibrillation, with Especial Reference to Dosage and Effects of Intraventricular Conduction. Amer. Heart Jour., **9**:219, 1933.
26. Pardee, H. E. B.: Complete Clinical Recovery After Thrombosis of a Coronary Branch. Amer. Heart Jour., **2**:442, 1926-7.
27. White, Paul D.: Longevity After Coronary Thrombosis. J.A.M.A., **100**:233, 1933.

121 East 60th Street

ADVANCES IN THE DIETARY MANAGEMENT OF DIABETES*

By CYRIL MITCHELL MACBRYDE, M.D.†
St. Louis, Missouri

In recent years we have witnessed a trend toward allowing relatively large amounts of carbohydrate in the diabetic diet. Clinically it has been shown that many diabetics experience a definite improvement in health, and that the sugar tolerance increases when more carbohydrate is given. This has been a remarkable and important advance in our knowledge. On the other hand, it has been found that many other diabetics fail to show this gain in the ability to metabolize sugar. As yet there is no satisfactory explanation of the physiologic changes bringing about this improvement in tolerance. Similarly, up to the present time we have been unable to discover why all diabetics do not respond alike in this respect.

In the past the treatment of diabetes was conducted upon the principle that strict limitation of carbohydrate was necessary. The introduction of insulin has allowed us temporarily to forget the sound laboratory evidence and the long clinical experience supporting this principle.

From this viewpoint it is interesting to review the history of the dietary management of diabetes. Naunyn[1] found it necessary to limit carbohydrate to very small amounts. "Schonungstage" or vegetable days were introduced in which practically no carbohydrate was given, and gains in tolerance were noted. Von Noorden[2] discovered that allowing some patients larger amounts of carbohydrate raised the tolerance, and his "oatmeal cure" and Falta's "Mehlfruchte cure"[3] had their vogues. It was still common experience, however, that excessive carbohydrate consumption increased the severity of the diabetes, and led to deterioration in the clinical condition of the patient.

STARVATION, HIGH FAT AND HIGH CARBOHYDRATE DIETS

F. M. Allen[4] introduced a new era of treatment, based largely upon the results of animal

*Read in General Clinical Session, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

†From the Department of Medicine, Washington University School of Medicine and Barnes Hospital, St. Louis, Missouri.

experiments. He found that dogs who have lost a certain amount of pancreatic tissue will become diabetic irrespective of diet. Dogs retaining a sufficient amount of pancreas will never become diabetic. Between these two classes is a third group which is on the borderline of pancreatic diabetes. If such an animal is given a low carbohydrate diet he improves; if he is given large amounts of carbohydrate he rapidly gets worse and dies of diabetes. It was concluded that the rich diet exhausted the pancreatic tissue. Upon this basis were established the lowest carbohydrate diets and the starvation treatment, which were undeniably a great advance and were followed for many years with success.

Next came the Newburgh and Marsh[5] and the Petrén[6] high fat diets, contributing the valuable knowledge that large amounts of fat are borne well by many diabetics.

As the use of insulin became more common, higher and higher corbohydrate has been allowed,[7] so that now it seems that the pendulum is nearing the end of its swing away from the opposite extreme, the starvation diet. It has been confusing to most of us to see that good results were obtained by opposite types of diet. Most of us have adopted the apparently safe middle ground, and give moderate amounts of both fat and carbohydrate.

Perhaps, however, we should not expect all our patients to do well on this standard, compromise diet system. It is an important observation that some diabetics do well on high carbohydrate, while others do not. There must be some fundamental difference in the type of diabetes in these patients who react differently from each other.

EXTRA-PANCREATIC FACTORS IN DIABETES

It has become increasingly evident that we can no longer consider diabetes the unitarian disease it was once thought to be. Evidently a deficient secretion of insulin is not its only cause. Pathologic studies such as those of Warren,[8] who has demonstrated that any lesion found in the diabetic pancreas can be duplicated in the non-diabetic organ, lend support to the concept that some cases may be extra-pancreatic in origin.

The pituitary has long been suspected as a possible participant in the etiology of diabetes. Acromegaly[9] and pituitary basophilism,[10] due to tumors of the anterior lobe, are frequently accompanied by diabetes. Patients with hypophyseal cachexia, or Simmond's disease, are hypersensitive to insulin. Extracts which raise the blood sugar and counteract the effect of insulin can be prepared from the anterior hypophysis. Animals suffering from pancreatic diabetes following pancreatectomy exhibit great improvement in carbohydrate tolerance if the hypophysis is also removed.[11]

The thyroid may also play a part in the causation of the disease. Hyperthyroidism is frequently accompanied by decreased sugar tolerance or frank diabetes. Not uncommonly the removal of the thyroid diminishes the severity of the diabetes and greatly increases the response to insulin.[12]

Both cortex and medulla of the suprarenal glands are closely concerned with carbohydrate metabolism. Patients with Addison's disease exhibit hypoglycemia and marked sensitivity to insulin. Post-insulin hypoglycemia can be overcome with injections of epinephrine. Patients with tumors of the adrenal cortex frequently have diabetes, and the removal of such a tumor may be followed by apparent cure of the diabetes.[13] Animals deprived of the cortical tissue of the adrenals fail to show the usual hyperglycemic response to injections of the pituitary diabetogenic hormone.

The chief source of glucose during fasting is the liver, and among extra-pancreatic factors affecting the blood sugar level it is of major importance. Disproportionately large doses of insulin are required by diabetics with various hepatic disorders.[14] Diminished tolerance to dextrose follows the reduction of liver glycogen. The action of epinephrine in raising the blood sugar is apparently through the resultant glycogenolysis in the liver.

The piqure experiment of Claude Bernard attracted attention to the importance of the nervous system in carbohydrate metabolism. It has long been known that injuries to or tumors affecting the hypothalmamic region may cause diabetes. Animals in which the sympathetic nerve supply to the adrenals is severed show a gain in sugar tolerance and are hypersensitive to insulin. Injections of the hypophyseal diabetogenic hormone fail to raise the blood sugar in such animals, indicating that the pituitary's influence is probably exerted through the sympathetic nervous system.[15]

The evidence at present certainly favors the view that many cases of diabetes are not due

primarily to deficient insulin secretion. A chain of factors including the nervous system, the pituitary, the thyroid, the suprarenals, and the liver, also influences the storage and combustion of carbohydrate. They are concerned in the etiology of hyperglycemia and alter the response to insulin whether it be produced in the body or injected.

If diabetes were purely a deficiency disease, quantitative use of the missing hormone should produce approximately the same effect in all patients. Early in the insulin era this was found not to be the case. Temporary conditions such as ketosis, infections, and psychic disturbances were observed to raise the insulin requirement. In addition, however, it was found that many patients show a relatively poor response to insulin as a constant characteristic. It seems reasonable to suppose that in many of these cases the diabetic state may be due partly, if not primarily, to extra-pancreatic, insulin-resistant factors.[16]

We have been concerned recently with an attempt to distinguish clinically those patients who may be expected to gain tolerance on a high carbohydrate intake from those who show no such gains. From the practical standpoint the ability to make such a distinction would be very important, enabling us not only to control the immediate necessities of treatment, but to plan the patient's future regime so that the maximum gain in tolerance could be secured.

RELATIVE INSULIN RESISTANCE

In an investigation started three years ago, we have found that most of the diabetics we have studied fall roughly into two groups, the relatively insulin-sensitive and the relatively insulin-resistant. By insulin-resistant we do not mean the type often indicated by the term, in which very large amounts of insulin, sometimes several hundred units per day, are required. Such cases, which are relatively rare, are as a rule explainable on the basis of some acute temporary disturbance. The resistance in our cases was slight to moderate in degree, was not due to any discernible complications, and seemed to be a persistent characteristic of the individual. The relatively sensitive were distinguished from the relatively resistant by several different methods.

Methods.—Blood sugar curves following the subcutaneous injection of 1.0 unit of insulin per 10 pounds of body weight were determined. Some patients showed a marked fall and definite hypoglycemic signs, while others showed relatively little response. This insulin tolerance test served as the first distinguishing criterion.

A second criterion employed was the "tolerated overdose." After the insulin requirement was determined, the total dose of insulin was gradually increased from day to day until a reaction was provoked. The amount of insulin a patient will tolerate above his daily requirement without experiencing hypoglycemic symptoms is called his "tolerated overdose." It was found that those patients falling into the sensitive group by the first test would tolerate little or no increase above the requirement and in most cases the tolerated overdose was zero. Those patients who were relatively resistant by the first test had as a rule a large tolerated overdose, reaching in some cases 60 units or more.

If some patients are relatively insulin-resistant it seems probable that their glucose equivalents would differ from the more sensitive group. The glucose equivalent, representing the number of grams of glucose metabolized per unit of insulin, was calculated by dividing the number of grams excreted by the insulin required to eliminate the glycosuria. The glucose equivalent is high in the sensitive cases, ranging from approximately one to approximately three grams, and averaging over two grams. In many of the resistant cases it was only a few tenths of a gram, and in all of them averaged less than one-half gram. The wide difference between the glucose-equivalents serves as a third distinguishing characteristic between the two groups.

CLINICAL CHARACTERISTICS

Certain clinical characteristics seem to be associated with the factors determining the relative response to insulin. The resistant group is usually older, is frequently obese, and often has high blood pressure. The tendency to acidosis is slight. The sensitive type, on the other hand, is usually younger, thin, has low blood pressure, and a marked tendency to acidosis.

Further studies were then undertaken to see whether the two groups differed in their response to high carbohydrate diets. This portion of the study was divided into two parts, the hospital investigations of from three weeks to three months, and out-patient department ob-

servations lasting from six months to two years in each case.

In the hospital, patients were given control diets containing moderate amounts of carbohydrate and fat, and were then tried upon an equicaloric high carbohydrate diet. Upon return to the control diet, the sensitive cases seemed to have lost tolerance and excreted more glucose. The resistant cases seemed to have gained tolerance following the high carbohydrate intake and showed less glycosuria.

In the out-patient department over long periods of time the sensitive cases lost tolerance on high carbohydrate, or at least required definitely proportional increases in insulin. The resistant patients gained tolerance and the insulin could often be greatly reduced or even omitted entirely.

SUMMARY AND DISCUSSION

A review of the history of the dietary management of diabetes shows wide differences in the opinions concerning the optimum balance of the various foodstuffs. Recently an important advance in treatment has been made by the demonstration that many diabetics gain tolerance on high carbohydrate diets. Other patients, however, fail to show such gains.

Recent laboratory and clinical investigation indicates that diabetes may in many cases be due primarily to extra-pancreatic factors, of which disorders of the nervous system, the pituitary, the suprarenal glands, the thyroid and the liver seem most important.

A group of diabetics studied during the past two years fall roughly into two classes, the relatively insulin-sensitive and the relatively insulin-resistant. In most instances, the sensitive cases showed no gains in carbohydrate tolerance upon a high carbohydrate intake. The resistant type, however, showed quite consistent gains in tolerance as a result of increasing the carbohydrate allowance.

It is interesting to note that there is some resemblance between the response of the sensitive type and Allen's partially pancreatectomized dogs. They react as if they suffered from more or less purely insular or pancreatic diabetes. They respond well to exogenous insulin, but seem to produce too little in their own bodies. They seem to lose tolerance when the strain of excessive carbohydrate is put upon the numerically decreased or damaged pancreatic islets.

The relatively resistant type responds as if the diabetes were at least partly due to extra-insular factors, which may be inhibited as the carbohydrate intake increases.

By studies such as those described, it may be possible for us to distinguish cases primarily insular from those largely extra-insular. At present it seems probable that the tests I have described will prove useful in indicating the type of diet for each patient which may be expected to lead to maximum individual carbohydrate tolerance.

REFERENCES

1. Naunyn, Bernard: Der Diabetes melitus. 2. Aufl. Wien, Holder, 1906.
2. Von Noorden, C. H.: Die Zuckerkrankheit und ihre Behandlung. 5. Aufl., Berlin, Hirschwald, 1910. Berl. klin. Wchnschr., **40**:817, 1903.
3. Falta, W.: Die Amylazeen (Mehlfruchte) in der Kost der Zuckerkranken. Wien. klin. Wchnschr., **31**:1199, 1918.
4. Allen, F. M.; Stillman, Edgar; and Fitz, Reginald: Total Dietary Regulation in the Treatment of Diabetes. Monograph No. 11, Rockefeller Inst., New York, 1919.
5. Newburgh, L. H.; and Marsh, P. L.: The Use of a High Fat Diet in the Treatment of Diabetes Mellitus. Arch. Int. Med., **26**:647 (Dec.) 1920.
6. Petren, K.: Ueber die Grunde der diatetischen Behandlung des Diabetes. Munchen. med. Wchnschr., **74**:1123 (July 8) 1927.
7. Sansum, W. D.; Blatherwick, N. R.; and Bowden, R.: Use of High Carbohydrate Diets in Treatment of Diabetes Mellitus. J.A.M.A., **86**:178 (Jan. 16) 1926.
   Adlersberg, D.; and Porges, O.: Zur Theorie und Praxis der kurativen Diabetesbehandlung. Klin. Wchnschr., **5**:1451 (Aug. 6) 1926.
   Geyelin, H. R.: Treatment of Diabetes with Insulin (After Ten Years), Contrasting Effects of Normal and of Older Diabetic Diets. J.A.M.A., **104**:1203 (April 6) 1935.
8. Warren, S.: Pathology of Pancreas in Nondiabetic Persons. Arch. Int. Med., **44**:663 (Nov.) 1929.
9. Cushing, H.; and Davidoff, L. M.: Pathological Findings in Four Cases of Acromegaly. Monograph No. 22, Rockefeller Inst., New York, 1927.
10. Cushing, H.: The Basophil Adenomas of the Pituitary Body and Their Clinical Manifestations (Pituitary Basophilism). Bull. Johns Hopkins Hosp., **50**:137 (March) 1932.
11. Houssay, B. A.; and Biasotti, A.: The Hypophysis, Carbohydrate Metabolism and Diabetes. Endocrinology, **15**:511 (Nov.-Dec.) 1931.
12. Strauss, H.: Ueber insulin-resistente Diabetiker. Klin. Wchnschr., **4**:491 (March 12) 1925.
    Kogan, V.: Antagonismus und Korrelation zwischen Pankreas, Nebenneiren und Hyphophysis. Ztschr. f. klin. Med., **104**:457, 1926.
    Serio, F.: Zur Kenntnis der insulinresistenten Diabetes. Klin. Wchnschr., **10**:1998 (Oct. 24) 1931.
13. Walters, Waltman; Wilder, R. M.; and Kepler, E. T.: Suprarenal Cortical Syndrome with Presentation of Ten Cases. Ann. Surg., **100**:670 (Oct.) 1934.
14. Leech, E. B.: Bronzed Diabetes: Its Reactions to Dietetic and Insulin Treatment. Lancet, **2**:69 (July 14) 1923.
    Widal, F.; Abrami, P.; Weill, A.; and Laudat: Action dissociee de l'insuline sur la glycosurie et l'acetonurie. Press med., **1**:453 (May 16) 1925.
    Chabrol, E.; and Hebert, P.: Paris med., **1**:453 (May 16) 1925.
    Boller, R.; and Ueberrak, K.: Die Insulintoleranz bei Fallen von Ikterus. Klin. Wchnschr., **11**:671 (April 16) 1932.
15. Lucke, H.; Heydemann, E. R.; and Hahndel, H.: Untersuchungen uber den Wirkungsmechanismus des kontrainsularen Hormons des Hypophysenvorderlappens, III. Ztschr. f. d. ges. exper. Med., **91**:492, 1933.
16. MacBryde, C. M.: Insulin Resistance in Diabetes Mellitus. Arch. Int. Med., **52**:932 (Dec.) 1933.

GALLBLADDER DISEASE*

HOW DIAGNOSE IT? HOW TREAT IT?

By LAY MARTIN, M.D.
Baltimore, Maryland

The subject which I wish to present to you for consideration is the diseased gallbladder. As is evident to you by the title, I do not feel that we are in a position to state that all the criteria for diagnosis and treatment are well established. Therefore I should like to present the methods and ideas which are in use at the Gastro-Intestinal Clinic of the Johns Hopkins Hospital. These include those we have learned through the process of trial and error, those we have discovered by planned experiment, and also those which have been developed by investigators in other clinics whose contributions have been an aid and stimulus to us.

I shall try to unfold the subject as systematically as possible, but it will be necessary at times to go ahead of my story in order to bring in clarifying points, and at others to utilize topics previously mentioned. To this end I shall discuss pathology, symptomatology, cholecystography, duodenal drainage *via* tube, diagnoses, and lastly treatment.

PATHOLOGY

The gallbladder may undergo several types of disorder which may be roughly classified as infection, metabolic change, metabolic change with stone formation, and lastly, new growths. There are graded manifestations of each of these abnormalities, and varying stages may be found individually or in any group of combinations.

Infection.—In considering infection we find stages running from that of low-grade infection with small wandering cells, which can be recognized only microscopically, through the stages of greater degrees of infection and wandering cell invasion which can be recognized grossly, to the stages of suppuration, necrosis and gangrene.

Bacterial infection has been listed by some as the etiological factor underlying most gallbladder disease. This point may possibly be true, but it is astonishing how often the organs, removed at operation for one cause or another, fail to produce growths on carefully selected media. In the general field of gallbladder biopsy the variation of reported positive cultures varies from 35 per cent to 65 per cent under the direction of competent workers. In recent years there have been numerous reports of the presence of Bacillus welchii, and some of the investigators find it as a common contaminant of the liver.

Whether the organisms present in the liver can invade the gallbladder and vice versa is a problem that has not been satisfactorily settled. From the investigations of Winkenwerder[1] it would seem that there is no direct system of lymphatics going from the gallbladder into the liver lobules. On the other hand, Graham[2] and his associates believe that under abnormal conditions this lymphatic pathway opens up, and that, given an infection in one organ, it may pass on to the other. This unsettled question leaves open for the future the problem of whether a diseased gallbladder can seriously impair non-contiguous portions of the liver.

Metabolic Changes.—That metabolic irregularities may be the basis of certain types of gallbladder disease is generally recognized. The most outstanding example of this type of abnormality is found in cholesterosis of the gallbladder, a condition in which the epithelial layer of the organ is more or less deeply filled with a deposit of cholesterol. The cause and method of development of this disturbance is not understood. How could it be when the investigators of the problem of cholesterol metabolism are not agreed as to whether it is secreted from the gallbladder into the bile, or absorbed from the bile by the epithelial cells of the vesicle?

Gallstones are responsible for distressing symptoms and innumerable investigators have searched for their cause. Not long ago they were generally believed to arise from an infected gallbladder, but here again it is of particular importance to note that competent bacteriologists have been unable to demonstrate infection in a large percentage of diseased gallbladders.

In more recent years the excellently conceived and carefully carried out experiments of a number of men[3 4 5] on the physiochemical relationship between the gallbladder and the bile have opened a new interest in the probability that irregular metabolic processes are the basis for many stone formations.

The subject of benign and malignant tumors

---

*Read in Section on Gastroenterology, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

*From the Gastro-Intestinal Division of the Department of Medicine, Johns Hopkins Hospital and University.

of the gallbladder is a large one in itself and will not be discussed in this paper.

SYMPTOMS

As in most diseases, the history of the attacks is of fundamental importance, not that it will establish a diagnosis in the majority of cases, but it will in a way limit the diagnostic problem. Indeed, when the history is most classical the need for caution in jumping at conclusions is the most pressing. There is ample proof that a sudden glow of smug satisfaction is apt to be ignominiously snuffed out in the light of careful and searching diagnostic procedures.

In describing symptomatology it seems wise to make a distinction, though it be an artificial one, between acute and chronic disease of the gallbladder. The acute attack may be a sudden burst coming for the first time, or there may be a series of them springing out from a background of low-grade discomfort. There also may be exacerbations different only in degree.

An acute attack varies somewhat with its cause. In the case of stones it is often excruciating, the pain usually originating in the upper right quadrant and often spreading over the right side, and frequently into the back. It is usually relieved by morphine and the patient is generally left with a feeling of fatigue and some tenderness over the gallbladder region. There may or may not be fever and leukocytosis.

The acute attack brought on by more or less severe infection simulates that of gallstones, with the exception that it is usually less severe and is always accompanied by fever and leukocytosis. In this instance morphine will give temporary relief, but, as one would expect from the nature of the lesion, there is usually more residual discomfort and the duration of the attack is much more protracted.

At this point it might be of interest to say something about the cause of the pain. In the case of cholelithiasis it is generally considered that the pain results from the stone's being wedged into a passageway such as the neck of the bladder or the cystic duct and kept there by sustained contraction of the wall of the organ. In the non-calculous organ many writers state their belief that the pain is caused by mucus or pus which is similarly constricted. There is, however, another viewpoint which seems worthy of consideration. Many of these vesicles are so badly diseased throughout their entire body that their ability to go into a spastic state would seem impossible. Is it not likely that the inflammation *per se*, as in other tissues of the body, may be the cause of the pain? Either from distention or from the secondary toxic necrotic agents acting on local nerve endings? Ritter[6] has recently published a very interesting paper dealing with this phase of the subject.

The acute attacks, however, are dramatic affairs and leave no doubt that some serious reaction is taking place within the body. That which needs the greatest care and attention to detail is the history of chronic cholecystitis or cholelithiasis. Here the symptoms are vague, bizarre and difficult of analysis.

It should be remembered that for years the diagnosis of chronic gallbladder disease has been made without the aid of such recent developments as the dye method of cholecystography and duodenal drainage. In a series of cases reported by King and myself[7] in 1928, we noted that the diagnosis made by men in the Gastro-Intestinal Clinic agreed in 85 per cent of the cases with the diagnosis as demonstrated by cholecystography, or operation, or both.

As its name, chronic cholecystitis, would indicate, the disease is often a protracted one and there must be many individuals who suffer mild stages of infection which do not produce sufficient symptoms to reach the threshold of conscious discomfort. It is also probably true that due to a more advanced stage of disease many patients experience recurrent attacks of dyspepsia with consciousness of abdominal distention, regurgitation, bloating, burning, gas and eructation, anorexia, and such general symptoms as mild lassitude, fitful sleeping, constipation, and headaches.

As the involvement becomes more severe, the attacks begin with greater intensity, the symptoms become more localized, and there may be discomfort in the upper right quadrant, often amounting to a low-grade pain. Frequently those patients state that they have a sore spot in the back, and generally localize it about the inferior angle of the scapula. They may notice that they feel worse after eating, and frequently become convinced that certain types of foods, notably indigestible or greasy ones, are distressing to them. At times they eliminate one food after another until they attempt to sustain themselves on an inadequate diet.

To await the development of jaundice in instances of cholelithiasis or cholecystitis before making a diagnosis is often to await the unattainable, for jaundice need not be a sequel of

gallbladder disease. In fact, when it is present it is evidence that the patient is suffering from liver as well as gallbladder disease.

I have noted with interest the statement by Rolleston and McNee in their treatise on "Diseases of the Liver, Gallbladder and Bile Ducts" to the effect that patients with diseased gallbladders are of the phlegmatic type. This is undoubtedly true in a large percentage of cases, but a fact that has stood out in my experience is that many of these patients become so nervous that they have been called neurasthenics.

Physical Examination.—It has been commonly noted that gallbladder disease is more apt to occur in individuals with wide costal margins and well set up chests, but it may and frequently does occur regardless of the habitus.

In the early stages of the disease examination of the abdomen will show no significant signs. As the disease assumes more advanced stages there is an increased muscle tonus in the upper right quadrant. The liver edge may be tender on palpation and there may be localized tenderness over the gallbladder area. There is much talk in the literature about palpation of this organ. This maneuver has been almost impossible of attainment in my hands, and I am almost never convinced that I have really outlined it. There is a strong probability that the tip of a lobe may be mistaken for it.

X-Ray.—To attempt to throw any light on the value of the dye method of cholecystography, especially when in the home of the originators and early developers of the method, would indeed seem the height of temerity. However, as I remarked in the beginning, I am only presenting you with the results of our experience with this and other methods utilized in the attempt to diagnose gallbladder disease.

The tremendous assistance that this method has given us in the ability to demonstrate gallstones by x-ray is common knowledge to all. That gallstones when seen can always be considered directly or indirectly responsible for the patient's symptoms is another matter. It is very comforting, however, to be able to demonstrate cholelithiasis when the history and physical examination point towards it as the most likely diagnostic possibility.

There are a number of apparently abnormal findings besides stones which can be seen on this type of film. Papillomata have been recognized, distortion of the shape of the shadow may be due to congenital abnormalities or to adhesions, and there is often a variation in the density of the shadow. In the hands of the expert a correct interpretation of the first two findings can be made in a satisfactory percentage of cases. The interpretation of various degrees of density of gallbladder shadows is much more difficult and I do not at present place any confidence in our ability to choose between the normal and abnormal organ on this basis.

The non-visualizing gallbladder is the one which presents the harder problem. In the early days of the oral method of administration when a repetition was done in all cases that did not visualize, King and I[7] found that there was a 20 per cent error on each side, that is, 20 per cent of the cases we considered normal controls did not fill or at best concentrate, and 20 per cent of the diseased ones showed normal function. The latter group were in the major part corroborated at operation. In more recent days, as numerous workers improved on the method of oral administration, the percentage of false positives, that is, normal organs not visualized, has markedly declined; naturally there has been but little change in the latter.

The problem in the case of the non-filling gallbladder is concerned not only with the decision as to whether the organ is diseased or normal, but with the institution of the best method of treatment. In this instance we must even more carefully use our other methods of investigation, such as history, physical examination and, as will be outlined, Lyons' methods of duodenal drainage.

DUODENAL DRAINAGE

In a report of this type it is essential to be as concise as possible. If the statements made below seem less than praiseworthy of this method of investigation, it is contrary to the ideas of the writer. Dr. Lyons and his group of coworkers have for a number of years carried out an investigation of tremendous scope, and have so well interpreted the findings that it is now possible to describe them somewhat briefly. Dr. Lyons has also recently published an "Atlas" on the subject, which is a tribute to his work.

As I mentioned above, the examination of bile, as obtained by duodenal drainage, may be of real assistance in determining the cause for a non-filling gallbladder by x-ray after tetraiodophenolphthalein administration. If, in patients with intact biliary vesicles, normal amounts and concentrations of A, B and C bile are obtained, it may be reasonably assumed that

the gallbladder is concentrating bile. If crystals of cholesterol, calcium bilirubinate, bilirubin or calcium carbonate are found the question becomes more complicated. That overemphasis on the importance of the presence of these materials in the bile has resulted in the removal of a considerable number of normal or medically curable gallbladders, I am confident. Certainly I have been no outstanding exception. As in all matters of this type, experience is necessary for judgment and appreciation of the significance of the findings.

One of the most helpful points is the repeated absence of B bile following successful drainage. This negative finding in association with an x-ray diagnosis of the non-filling gallbladder is strong evidence that the organ is diseased. Again, if there is evidence of slight or no concentration of bile in association with the presence of unusual amounts of one or more types of crystals enumerated above one may reasonably assume there is cholelithiasis.

We have noted that an important percentage of the patients whose clinical study is suggestive of gallbladder disease show normal filling and emptying of the organ by the x-ray technic. In these patients the use of diagnostic biliary drainage is also well worth while, for the findings may support the clinical impression, or throw additional weight on the side of the normal x-ray finding. In certain instances repeated drainages are worth the effort.

The possibility of isolating the specific bacterial organism by this method is indeed a slim one, and as I have noted before[8] it would take a man of great faith to believe in the probability that an organism grown from the duodenally drained bile could be regarded as the infecting agent.

The originator of this method states that there are other findings which are pathognomonic of gallbladder disease, for instance the presence of bile stained epithelial cells from the gallbladder is evidence that there is some destructive process active in the mucous membrane. He also believes he can diagnose catarrh of the cystic duct, and furthermore that it can be cured by repeated non-surgical biliary drainage. In the hands of Dr. Lyons I have no reason to doubt that such observations and diagnoses have been made. We, who have done a considerable number of drainages, but much fewer than he, have not been able to make use of these refinements.

DIAGNOSIS

To a mathematically minded person it would seem that the analysis of the data combined from many sources would in the great proportion of cases lead to a reliable diagnosis. To such a person it probably would, except that he would always be on the lookout for variables, and as a variable *par excellence* I can think of no better illustration than a patient. How nice it would be if, as Draper smoothly and pleasingly teaches, there were a really dependable constitutional factor! If patients of certain specified dimensions only had specific diseases and *vice versa*, if various diseases or infective agents always chose certain well defined characters for the seat of their activities. Unfortunately, it has not been our experience that we could so segregate the host or the infective agents.

The symptoms which I have adumbrated to you as suggestive of gallbladder disease are unfortunately by no means exclusively noted in this one ailment. Malposition, infection, obstruction, calculi, and tumors of the kidney give rise to symptoms of almost identical degree. Erosions in the stomach and duodenum do not always cause the symptoms which are suggestive of these conditions, and furthermore typical ulcer symptoms may at times be associated with gallbladder disease. One of the most common causes of discomfort in the upper right quadrant is constipation, and I believe a number of incorrect diagnoses have been made on this basis. Migraine may be associated with severe upper right quadrant pain in the presence of a normal gallbladder.

In short, as has been noted, there is no royal road towards the diagnosis of gallbladder disease. In a great number of patients the diagnosis can be made with relative ease, but in the smaller number experience and openmindedness in using various forms of investigation are necessary. It is also important that one should be willing to allow the condition to remain undiagnosed until sufficient time for study and mature observation has elapsed.

The question of a possible superimposed concomitant liver involvement is important, not only in a complete diagnosis but also in deciding upon the best form of treatment. In addition to the studies noted above the estimation of serum bilirubin and one of the liver function dye tests might be utilized. If in the opinion of the examiner the disease of the gallbladder

is affecting the liver, he is much more apt to consider earlier surgical interference.

TREATMENT

The solution of the problem of the treatment of this condition also presents its pitfalls. There is, however, one statement that can be made with complete assurance. If there is any real doubt about the diagnosis, do not operate, unless you are driven to it. The gallbladder is an important organ; it is not a vestigial remnant like the appendix, and it should not be removed unless the discomfort it causes is sufficient to justify one of depriving the body of its function.

We have never been unrestricted in the removal of non-calculous gallbladders, as it has been our experience that unless there were good cause for its removal it had better be left alone and treated medically; otherwise the percentage of postoperative recurrence of symptoms will be high. This may be due to several reasons, the most probable of which is that the gallbladder, although diseased, has not been the sole cause of the patient's symptoms. Even with the most careful diagnostic study this mistake has been made, and will undoubtedly continue to be made, for obviously medicine is not yet sufficiently advanced to diagnose all gastro-intestinal abnormalities.

In contrast to the negative statement for therapeutic treatment made above, an equally positive statement may be made about the problem of cholesterosis and cholelithiasis with repeated attacks of pain. The only therapy is surgery.

However, it is not too fantastic to believe that some day someone is going to present us with a method of correcting the unbalanced metabolic process which causes gallstones, and at the same time to discover a method for dissolution of the more simply formed ones.

The question of surgical treatment of the patient with non-calculous cholecystitis had best be left up to the patient. If medical treatment is of no avail and he would rather be operated upon (knowing the facts), so be it, let him.

Gallbladder disease is shown by its percentage of occurrence in general post mortem examinations to be a common finding. We do not know what percentage of these people may have been suffering from minor manifestations of the ailment, but certainly a large number of them did not notice it sufficiently to have it appear in their histories. It is probable that many persons have self-limited attacks and perhaps only a few of them become chronic sufferers. Consideration of this background will induce a conservative attitude in the treatment of the disease.

For years patients have been relieved of symptoms by simple remedial agents such as adoption of a sensible routine of hygiene, rest, exercise, and sufficient sleep; we have found that small doses of saline in warm water some time before breakfast, tolerance doses of belladonna, a light easily digestible diet, with the elimination of greasy food, heavy meats, and high seasoning, will usually bring relief of symptoms.

I find myself at a loss on the question of the use of fats. It is well known that cream and egg yolk are the best stimulants for gallbladder evacuation and that good results are reported from their use in cholecystitis. The question comes to me as to why they should work. If the disease is in the wall of the gallbladder, I fail to see how constant irritation of the affected area by muscular contraction can be a helpful maneuver, especially when it has not been proven that there is local infection in all of the cases.

The proponents of biliary drainage are adamant in their belief that there is the real method of medical treatment. They say this even though it is known that we can satisfactorily empty gallbladders by the oral administration of salts and fats. We have treated numerous cases by duodenal drainage, and I am free to admit that a certain number of them are better. I do not think that they are any better off than those that have received more conservative forms of treatment, and as I look back over the cases I get the feeling that those who were most benefited by duodenal drainage were those of the neurotic type.

SUMMARY

The usefulness of certain methods, anamnesis, physical examination, cholecystography, duodenal drainage in the diagnosis of gallbadder disease has been discussed. The benefit to be expected from various forms of treatment has been outlined.

REFERENCES

1. Wikenwerder, W. L.: Study of Lymphatics of Gallbladder of a Cat. Bull. Johns Hop. Hosp., **41**:226, 1927.
Study of Resorption from Biliary Tract, with Especial Reference to Morphology and Permeability of Cystic Epithelium. Ibid, **46**:272, 1930.
2. Graham, E. A.: The Clinical Application of Some Recent Knowledge of the Biliary Tract and of the Pancreas. The Harvey Lectures, series 29,176, 1933-34.
3. Riegel, C.; Johnston, C. G.; and Ravidin, I. S.: Studies on Gallbladder, Function, Fate of Bile Pigment and Cholesterol in Hepatic Bile Subjected to Gallbladder Activity. Jour. Exper. Med., **56**:1, 1932.
Ravidin, I. S.; Riegel, C.; Johnston, C. G.; and Morrison, G. A.: Biliary Tract Disease. J.A.M.A., **103**:1504, 1934.
4. Rous, P.; and McMaster, P. D.: Physiological Causes for Varied Character of Stasis Bile. Jour. Exper. Med., **34**:75, 1921.
Rous, P.; Braun, G. O.; and McMaster, P. D.: Studies on Total Bile Effects of Operation, Exercise, Hot Weather, Relief of Obstruction, Intercurrent Disease and Other Normal and Pathological Influences. Jour. Exp. Med., **37**:395, 1923.
McMaster, P. D.; and Elman, P.: Studies on Urobilin Physiology and Pathology. II. The Derivation of Urobilin. Jour. Exper. Med., **41**:513, 1925.
III. Absorption of Pigment of Biliary Derivation from the Intestine, pp. 719-738.
VI. The Relation of Biliary Infection to the Genesis and Excretion of Urobilin. Ibid, **43**:753.
5. Elman, R.; and Taussig, J. B.: Increase in Cholesterol Content of Gallbladder Bile Following Ligature of the Cystic Duct. Proc. Soc. Exper. Biol. & Med., **28**:1066, 1931.
6. Ritter, C.: Zur. Entstehung des Schmerzes bei der Gallenblasement. Bruns' Bertrage z. Klin. Chir., **161**:1, 1935.
7. King. J. H.; and Martin, L.: A Clinical Evaluation of Cholecystography by the Oral Administration of Tetraiodophenolphthalein: A Summary. Bull. Johns Hop. Hosp., **41**:219, 1927.
8. Martin, L.: Biliary, Pancreatic and Duodenal Studies: Estimation of Value of Duodenal Drainage for the Diagnosis of Biliary Diseases Based on the Examination of Fifty Patients. Arch. Int. Med., **39**:356, 1927.

DISCUSSION (*Abstract*)

Dr. Hugh J. Morgan, Nashville, Tenn.—I find myself at variance with what I judge to be Dr. Martin's point of view regarding the diagnosis of gallbladder disease. If I have understood him correctly, he has implied that at times it is an extremely difficult diagnosis to make. This has not been my experience. It seems to me that a carefully evaluated history and a properly performed examination of the patient answer the question as to the presence or absence of gallbladder disease in the large majority of cases. Cholecystography has proven to be one of the most reliable diagnostic procedures when properly performed and interpreted. Experience has taught us that it is much more reliable in its field than is the Wassermann test, for example, in the field of syphilis.

It seems to me that the indications for the surgical treatment of chronic cholecystitis may be summarized as follows: operative treatment should be employed in the presence of (1) cholelithiasis associated with colic; (2) chronic cholecystitis with colic, with or without cholelithiasis; (3) chronic cholecystitis with localized right upper quadrant pain and tenderness. Concerning these three groups the indications for operative intervention seem clear.

What to do for a person who has dyspepsia and a gallbladder which will not concentrate the Graham diet or the individual with a large "silent" stone and a gallbladder which concentrates well is another problem and one which taxes the resourcefulness of the physician and often the loyalty of the patient.

THE INTERNIST'S ATTITUDE TOWARD UNUSUAL X-RAY FINDINGS IN THE APPENDIX AREA*

By HAROLD BOWCOCK, M.D.
Atlanta, Georgia

The rather ambiguous title of this paper could be worded more appropriately with the question: "What is the significance of prolonged retention of barium in the appendix area during x-ray examination of the gastro - intestinal tract?". This question, however, is an academic one because neither personal experience nor recorded experiences are sufficiently numerous to provide the answer. Consequently, my chief aim is to focus attention upon a finding which is not infrequent and which may be of great speculative importance in individual cases.

Retention of barium over a period of days or weeks will be encountered by chance or when looked for frequently. Since the usual x-ray examination of the gastro-intestinal tract covers a period of only 24 or 48 hours, most instances of retention are undiscovered and the chance finding of prolonged retention may be regarded as a pathological curiosity. Obviously, prolonged barium retention must constitute either a rather uncommon but normal variant, or the finding is one of pathological significance. Proof of either assumption, normal or abnormal, can be derived only from prolonged observation of many patients in whom retention has been demonstrated. One must know whether retention is due always to an influence at the area of retention or to a remote reflex influence. Further, if retention is indicative of a process requiring treatment the decision must be reached as to whether this treatment should be medical or surgical.

Without being able to offer the solution to this complex problem, I have ventured to record briefly the findings from eight illustrative cases chosen from a larger group in which the duration of retention of barium was striking, believing that the greater the duration of retention, the simpler it should be to evaluate its importance. Each of the following cases has received careful study, including all of the routine blood, urine, stool, x-ray and special ex-

*Read in Section on Gastroenterology, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

aminations indicated; the patients have naturally been considered from the standpoint of personality, temperament and habits. Only essential details are mentioned in the case reports:

Case 1.—A man aged 33 years had had typical symptoms of a duodenal ulcer and periods of marked constipation for nine years. The diagnosis of duodenal ulcer had been confirmed by x-ray. Sixteen days after taking barium for fluoroscopic examination of the stomach, he had experienced an attack of renal colic. An x-ray picture of the genito-urinary tract at this time, sixteen days after barium, showed two stones in the left kidney and a long beaded appendix filled with barium. This patient had never experienced symptoms pointing to the appendix area, but because of the associated pathologic condition appendectomy was advised. The appendix was long, was held by a few adhesions, and was constricted at one point. When opened, fecoliths and a prune juice colored fluid were present. Smears from this fluid showed gram-negative bacilli and gram-positive cocci, the latter in pairs and chains. During the five years since operation there has been no constipation, no ulcer symptoms and the duodenal cap has been normal in appearance. The number, size and position of the kidney stones is unchanged. The improvement after appendectomy may be a coincidence, but the patient is confident that this is not the case.

Case 2.—A man, 43 years of age, had had recurrent typical clinical symptoms of a duodenal ulcer for seven years. X-ray examination of the gastro-intestinal tract after barium showed a persistent defect in the duodenal cap. A long beaded appendix was visualized and retained barium for eight days. There was no tenderness over the appendix. Blood sugar and urine examination revealed a benign glycosuria. Appendectomy was not advised. Diet control has relieved the ulcer symptoms. Should this appendix be removed?

Case 3.—A man, aged 20 years, had had diphtheria at the age of 7 and since that time had lived in fear of a weak heart; consequently, he had avoided all forms of exercise. He complained of fullness immediately after eating and attacks of rapid heart rate. He said that he had been constipated all of his life; for the relief of constipation he ate much roughage and bran. The physical findings and circulatory response to exercise were normal. X-rays of the gastro-intestinal tract revealed only a spastic colon and an appendix which, although not visualized at 24 hours, was seen at 48 hours and the tip of which retained barium for 11 days. There was no local tenderness. The bowels moved better than usual after the barium. Exercise and mineral oil and the exclusion of coarse roughage and bran from the diet were advised. Six weeks later all symptoms had been relieved and upon the readministration of barium the appendix retained some barium for three days. Does this constitute an improvement due to medical treatment of an irritable bowel?

Case 4.—A man, aged 25 years, complained of lack of energy, drowsiness, vague abdominal discomfort and indefinite abdominal pains which had occurred at intervals for three years. X-ray study of the gastro-intestinal tract showed a persistent abnormality in the appearance of the duodenal cap, unchanged by the hypodermic administration of 1/75 grain of atropine sulphate. The appendix filled well with barium and retained beads of barium for three weeks. Since medical treatment did not produce complete relief during three weeks, the appendix was removed upon the patient's initiative. At operation, the appendix showed a few fine adhesions, the wall was thickened and the pathologist's microscopic diagnosis was chronic appendicitis. Three months after operation the patient says that he has been unable to gain weight and that he still suffers from drowsiness. Abdominal discomfort has disappeared. It is difficult to evaluate subjective improvement in this case because of the personality factor.

Case 5.—A man, aged 27 years, complained of pains in his back, weakness of the legs on walking, and a sensation of drowsiness, dizziness, and suffocation after meals. There was mask-like facies and the gait and neurological examination suggested a mild post-encephalitic Parkinsonian syndrome. A long, freely movable appendix without tenderness was easily palpated in the lower right quadrant. The palpation was repeated several times after the administration of barium under the horizontal fluoroscope, showing a long, well filled, freely movable appendix. At the end of two weeks after barium the appendix was half filled with barium; at three weeks it was empty. Appendectomy was not advised; it was felt that an abnormality of this type could hardly account for the chief symptoms from which the patient sought relief.

Case 6.—A woman, aged 20 years, had had recurring incapacitating attacks of slightly swollen and painful joints with slight fever for seven years. She had been advised to return home from college because it was felt that she had rheumatic fever and organic valvular heart disease. Tonsillectomy had not resulted in a decrease in the frequency or severity of attacks. Repeated careful observations led to the impression of a functional heart murmur, but no focus of infection could be found as the cause of the joint symptoms. Eighteen months after my examination the patient experienced an attack of severe pain low in the right abdomen, radiating into the bladder area without urinary disturbance, nausea, vomiting, or fever. There was tenderness over the urinary bladder on pressure and this tenderness persisted after the pain had subsided; the urine was normal. Three days after she had taken barium, the cecum, which was very low in the pelvis, contained a considerable amount of barium in spite of daily bowel movements. Six days after barium the cecum was free of barium, but a beaded appendix shadow was present low in the pelvis, almost in the midline, and there was tenderness to pressure at this point. Appendectomy was performed with the hope that the joint symptoms might be relieved. The appendix was found lying low in the pelvis, its walls were thickened and microscopic examination showed marked lymphocytic infiltration. For two years after operation the joint symptoms were practically absent. Five years after operation the patient states that there have been some recurrences of joint symptoms, but

fortunately the seizures have been much less frequent, milder, and not incapacitating. She is otherwise in excellent health. This case illustrates that caution should be used in claiming a therapeutic cure.

Case 7.—A woman, aged 25 years, had had disturbance of vision in one eye for ten years and in the other eye for six years. Repeated blood Wassermann tests and one spinal fluid examination had given normal results, in spite of which she had received two courses of anti-syphilitic treatment without a cure of the eye symptoms. For ten days there had been frequent attacks of pain in the lower right quadrant without radiation, nausea, vomiting or fever. Ophthalmoscopic examination showed an active chorio-retinitis with several areas of scarring. Physical examination and x-rays gave no evidence of tuberculosis. There was no tendency to constipation and the bowels moved daily. There was localized tenderness to pressure in the McBurney area. X-ray examination of the gastro-intestinal tract showed at 48 hours barium extending from cecum to sigmoid and a small amount of barium in the appendix; after five days some barium remained in the cecum and the colon seemed to be full of barium from the hepatic flexure to the rectum. One week after she had taken barium, the transverse and descending colon and sigmoid were faintly outlined with barium. This retention occurred in spite of the patient's assertion that she had had normal daily bowel movements during this week. The ophthalmologist expressed the opinion that the bowel might serve as the focus responsible for the eye condition. With the use of mineral oil and a smooth diet, several subsequent examinations of the intestinal tract showed a colon containing barium at the end of three days, but empty at the end of four days. There has been no further activity of the chorioretinitis during seven years. Appendectomy might have been credited with a cure. May medical treatment take that credit?

Case 8.—A man, aged 28 years, complained of extreme constipation, headache, drowsiness and lack of energy of two years' duration. He ate coarse foods and took strong cathartics regularly, but often went several days without a bowel movement. There was no tenderness in the region of the appendix. Examination of the gastro-intestinal tract after barium administration showed retention of barium in the cecum and appendix for six days. Smooth diet, mineral oil and general hygienic measures, retention oil enemas, massage and exercise had no effect upon his symptoms. After several months of treatment the patient, having experienced a mild attack of dull pain in the right lower quadrant, insisted upon removal of the appendix. Following the operation he gained 20 pounds in weight and six years later he insists that the operation relieved all of his complaints. The appendix was free of adhesions, about six inches long with a constriction proximal to a dilated tip.

The study of these cases fails to furnish a solution of the problem, but certain observations may be made. Prolonged barium retention can be discovered only by observing each patient until all barium has disappeared from the gastro-intestinal tract. Visualization of the appendix may not be realized until several days after the administration of barium, provided that there is barium stasis in the cecum. Sharply localized tenderness over the appendix area was absent in six of the cases described. Adhesions, although present in three of the four cases operated upon, were not striking and did not prevent free movement of the appendix under the fluoroscope in any case. Apparently, medical treatment did shorten the period of barium retention in some cases. The value of surgery in the four cases operated upon cannot be definitely stated, although two patients claimed marked improvement.

As I have raised the question, it is necessary that I express my viewpoint of the problem. It is my opinion that prolonged retention of barium in the appendix or cecum constitutes a physiologic abnormality, having in some cases no demonstrable pathologic significance. If, however, retention is accompanied by unexplainable symptoms of gastro-intestinal distress which are unresponsive to treatment, severe constipation which is unresponsive to treatment, with or without a history of previous attacks of pain suggesting appendicitis or sharply localized tenderness in the appendix area, the x-ray findings should be regarded as having real significance. Persistent tenderness is the most important among these signs and symptoms. Even in the presence of these more or less significant findings, I feel that in advising surgery the physician should express to the patient the hope rather than the promise of relief.

In order to obtain a true picture of surgical benefits, the patient should be observed during a period of medical treatment before operation. Operation should be advised only when other methods fail to produce relief. After operation, observation should be continued for a long period before a conclusion is reached regarding the value of the operation. Should this attitude be accepted as reasonable, it becomes apparent that the whole problem of barium stasis demands further study from the standpoint of incidence, significance and therapy.

DISCUSSION (*Abstract*)

Dr. Trimble Johnson, Atlanta, Ga.—Several years ago I realized that we were finding appendical and cecal

stasis in a surprising percentage of cases with epilepsy, toxic psychosis and migraine headaches. One patient who had been declared incurable by our best known medical clinics was relieved in a week after finding a pocket stagnation in the cecum and appendix. Last year I made a review to determine how frequently such stasis occurred and quote the following findings:

Among 1,811 case histories, colon x-ray examinations were done in 1,526. More than 700 examinations stopped at the 24-hour study, leaving the great majority of these in doubt as to condition at 48 and 72 hours. Six hundred and sixty-nine showed 48-hour stasis. Two hundred and eighteen, or 14 per cent of the total examined, had 72-hour stasis. This group included most of the cases of toxic psychosis, epilepsy, migraine and toxic arthritis.

The most astounding and enlightening finding in the whole review was that the average blood pressure in this 72-hour stasis group was 115, throwing serious doubt on the age-old supposition that intestinal stasis would cause hypertension.

In the total group of cases x-rayed, 1,106 still had their appendices. Of these 122, or 11 per cent, showed barium in the appendix after the cecum was empty, 89 at 72 hours or longer. Later observation of these indicated that stasis alone does not cause acute appendicitis.

Adding to the appendical stasis group those with barium in the cecum as well as the appendix, we find at 48 hours 234, or 21 per cent, and at 72 hours 119, or 10 per cent.

All of these percentages would undoubtedly have been higher had every case received 48 and 72-hour studies.

Therefore, stasis in the appendix or cecum or both is not rare. It is my personal belief that if the digestion and assimilation are good such stasis may cause no trouble, but where this stagnation is of undigested food it may be very toxic and cause gross trouble.

Dr. Henry M. Winans, Dallas, Tex.—Dr. Bowcock's statements in regard to this problem appear to me to reflect the best opinion in medicine today. The return of patients with the same symptoms complained of before operation, together with the pathologist's reports, has served to make us cautious in recommending operation. Moreover, the roentgenologists have apparently narrowed the criteria for the diagnosis of chronic appendicitis, or, to put it more practically, removable appendix, down to one finding: that of focal tenderness.

This problem does not seem capable of statistical analysis at the present time. The consideration of focal tenderness, cecal irritability, cecal stasis, beaded or adherent appendix, or appendical stasis, seems to depend upon the individual's reaction for the production of symptoms or their cure by operation.

In the absence of more dependable guides, the internist who knows the patient thoroughly and who has observed him over a long period should be the one to evaluate what part abnormal findings in regard to the appendix may play in the general health of the individual.

ACUTE APPENDICITIS IN CHILDREN*

By PHILIP F. BARBOUR, M.D.
Louisville, Kentucky

There is no age limit to appendicitis, several cases having been recorded in babies less than 48 hours old. It is relatively rare in childhood, but approaches its maximum in the second decade of life. The incidence decreases thereafter with age until in second childhood it is again very rare. The mortality, however, is greatest at the two extremes of life. The high mortality in the young is due to certain anatomical characteristics and to the greater difficulty of making an early accurate diagnosis.

The function of the appendix is in doubt. It probably is not merely a vestige of an organ whose usefulness has been lost in the evolution from lower planes of animal life. It arises from the cecum in early fetal life when the cecum still lies high in the right hypochondrium, just under the liver. As the transverse and ascending colons develop, the cecum should be pushed down into the right iliac fossa. This descent of the appendix is not always accomplished in the young child, and in fact the location of the appendix is very variable at that age. As the cecum descends the appendix is rotated inward and its blood supply may be endangered, which predisposes to inflammation. Some such anatomical peculiarity may be inherited and may explain that frequency of cases of appendicitis in certain families which many clinicians have noted.

Histologically, the appendix is less mature in the child. Lymphoid tissue is abundant at the expense of the mucosa. The muscularis mucosae is not continuous, and the muscular coat is much thinner than it is later in life. Consequently the peritoneum is more easily infected from the lumen. Boyd thinks that the presence of the lymphoid tissue is a protection against infection, but certainly other lymphoid structures are much more vulnerable in the young.

The lymphatic vessels of the appendix and cecum are noticeably larger and richer in the child, so that infection may easily pass to the cecal wall, which should therefore be examined most carefully by the surgeon. The possibility of an ascending phlebitis and a septic peritonitis

*Read in Section on Pediatrics, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

are ever present and a late rupture of the abdominal wound is more common in children. There is a large plexus of lymphatics behind the cecum which may harbor an infection and later may start up a low-grade peritonitis. Still more important, however, from the surgical standpoint, is the failure of the small, short omentum to wall off the infected area. The appendix is histologically less well developed so that rupture and/or gangrene may occur within a few hours with a resulting general peritonitis. The battle is often lost before the disease is recognized. Most surgeons approach an acute appendicitis in children with much misgiving.

The etiology still is obscure. Acute diarrheas, ileocolitis, trauma to the abdomen and worms, especially the oxyuris vermicularis and the ascaris, have each been accounted exciting causes. Before the onset of an acute infection there will often be a history of numerous attacks of vague abdominal pains which have promptly recovered. It is possible that these are attacks of acute catarrhal appendicitis which do not go on into a fulminating lesion. They may, however, leave fibrotic tissue behind with scar tissue and blocking of the lumen. This is sometimes called a chronic appendix, but it is not so termed by the majority of the pathologists. There is no question that such appendices are more apt to flare up into an acute attack so the incidence of appendicitis must increase with age until either an atrophy of the appendix or an immunity to infection is acquired in later life. The acute contagious diseases, especially measles, will often be followed or complicated by an acute appendicitis.

It sounds fanciful, but there may be a real relationship between a lack of vitamins and the onset of appendicitis. Egdahl* reports that appendicitis increased in Puerto Rico in one year from 1.66 to 5.52 on a diet of polished rice. When the deficiency of vitamin B was corrected the rate for appendicitis fell to 1.26 in 1933.

Statistics show an increasing incidence and mortality from appendicitis in spite of better diagnosis and an improved technic. In Kentucky negroes are known to be less liable to the disease than whites. A recent editorial in the *Journal of the American Medical Association* cites the fact that civilized diet is becoming deficient in vitamin A but that the negro gets more vitamin A because he eats a greater quantity of all foods than the white man, and grocers state that negroes eat more fresh green vegetables and less of the canned goods than the better class of whites. Aboriginal tribes are almost free from appendicitis and various species of monkeys become victims of the disease only when they have been brought into captivity. Boyd ("Surgical Pathology") believes that an increase of protein in the diet is the explanation; however, a marked lack of vitamin A affects all hollow viscera, especially the mucous cells lining the bronchi and intestine, and even when these cells have not undergone distinct keratinization, they are more easily infected and repair is slowed. Such facts certainly have some bearing upon this subject, which incidentally is one of the livest before surgeons at this time.

The organisms present are usually the streptococci and the colon bacilli; of the two, infections with streptococci are in every way more dangerous and fatal.

When we study the symptoms and diagnosis of acute appendicitis in children we find a much more puzzling problem than obtains in the adult. Often it takes the combined experience of surgeon and pediatrician to arrive at the correct solution. The diagnosis rests upon the concurrence of five symptoms: pain in the abdomen, a localized tumor in the lower right quadrant, nausea and vomiting, slight rise in temperature and some acceleration of the pulse. Of these the most important are the pain and the tender mass as the other symptoms are too general in their occurrence to be significant.

Pain is a subjective sensation and is notoriously unreliable in children. A frightened child will often deny that it has pain and so attempt to mislead the examiner or it may complain of pain at any point that is being touched or may ignore a really painful point when the attention is distracted.

Tenderness will vary usually with the location of the appendix. It may be encountered high up under the liver when the cecum has not descended, and may arouse suspicions of hepatic, cystic or diaphragmatic inflammation. The appendix may be retrocecal and there will be pain and resistance in the region of the right kidney, suggesting pyelitis or other acute nephritic condition. The presence of blood in the urine at the same time has been noted and adds to the confusion. When the appendix lies low in the pelvis the pain will be felt centrally and there is often a dysuria from irritation of the bladder and an ineffectual diarrhea from sigmoid or rectal involvement. Rarely the ap-

*Mil. Surgeon, 73:61 (Aug.) 1933.

pendix is closely adherent to the ileum and sudden signs of obstruction develop. Perhaps the most disconcerting finding will be that the pain is referred entirely to the left side, sometimes from a long peritoneal attachment but in most cases without any adequate explanation. This complaint of pain in the left side is encountered in the adult very rarely as compared with its frequency in children. Still further to complicate the picture is the referring of pain to the abdomen from some distant point through the sympathetic or even the somatic system.

The origin and distribution of the nerves of the central nervous system, both motor and sensory, are known very accurately. But the sympathetic relations are very much more variable. A preganglionic fibre from any level of the cord may pass through several sympathetic ganglia corresponding to the bodies of two or three vertebrae before reaching the particular ganglion through which it functions, so that sympathetic reactions may come from quite distant points and the pain felt in the abdomen may originate above the diaphragm and take its origin from lung or heart, and conversely pain originating in the abdomen may easily be referred to the level of the heart or higher. The function of the sympathetic system seems to be (1) an inhibition of the movements of the gut and (2) a contraction of the sphincters. Whether the reflex comes from an extra or intra-abdominal lesion, the sympathetic nerves will actively inhibit the movement of the bowels, and peristalsis will cease, especially if peritonitis has developed. The absence of any peristaltic wave in the gut will point very definitely to serious lesions in the abdomen. If, however, an active cathartic has been administered or the appendicitis follows upon a diarrheal attack, this inhibition of the sympathetic system will be overcome and peristalsis be felt or heard.

The most frequent and deceptive of the referred pains is due to a pneumonia, or pleurisy especially of the diaphragmatic type. A mistake here may lead to tragic results. The old dictum, "Always examine the back when a child complains of pain in the belly," will eliminate some of these blunders. The more rapid and grunting respiration, the cough and the high white count are helpful. An x-ray of the chest may fool us in the early stages of pneumonia because of the very slight shadow upon the film. If there is a reasonable doubt repeated blood checks will usually clear up the diagnosis without very great delay.

The appendix, because of the amount of lymphoid tissue, is sometimes called the abdominal tonsil. An acute tonsillitis may stir up sympathetic or real appendicular symptoms especially when complicating measles or other contagious diseases. Streptococcic involvement of the middle ear or of the sinuses or the upper respiratory passages may be accompanied by appendicular pain. Pyelitis, hydronephrosis, or other kidney disorders as well as ovarian or fallopian tube infections may easily confuse one.

Lead colic and plumbism which seem to be on the increase may cause vague abdominal pains, as will also the so-called rheumatism of the abdominal wall described by English writers.

Tuberculous or other lesions of the spinal column, if causing pain, should be evident.

The fact that pain may be allergic in origin should not be forgotten, though such cases are far more often encountered in the adult. A history of asthma, eczema, urticaria, sensitivity or even of the exudative diathesis should put us on guard. Usually the high eosinophilia will arouse a proper suspicion.

A tender mass in the lower right quadrant cannot always be made out, but the tactus eruditus and an understanding of child psychology are an unquestioned help. Usually in the presence of an acute appendicitis there will be increased tenderness over the vermiform process wherever it may be situated and some muscle guard, not marked as in the adult but usually detectable by the skilled examiner. Sweet has noted that the muscle guard is not continuous and may not be synchronous with the attacks of pain. Fraser ("Surgery of Childhood") states that pressure upward over the descending colon will cause pain in the inflamed appendix. Rebound or release pressure, that is, pressure anywhere over the abdomen and suddenly released will intensify the pain over the appendix. This is of great value. The diseased appendix may rest upon the psoas and iliacus muscles and extension of the right leg, as by placing the hand under the hip and raising it sharply, will cause pain. Rotation of the thigh, the so-called obturator sign, will also be painful.

Examination by the rectum is sometimes feasible, but the finger should feel the left side of the pelvis first and after the child becomes accustomed to the examining finger it may be moved around gently to the right side and the pain or tumor be more accurately delimited.

Intussusception does not simulate appendicitis

except possibly at the moment of the passing of the ileum into the cecum. The absence of fever and tenderness and the progression of symptoms will soon make differentiation easy.

A more difficult decision has to be made in cases of amebic dysentery which has attacked the ascending colon. Operation upon such cases will almost certainly have a fatal ending. The presence of blood or bloody mucus and pus in the stools is suggestive of this involvement or of a diverticulitis, or of intussusception. Very rarely will blood be found in the stools in an acute attack of appendicitis alone.

Examination of the blood will usually show a leukocytosis of 15,000 to 20,000 with a great increase in the polymorphonuclears. The more nearly the infection approaches the peritoneal coat the higher will be the leukocyte count. But there are undoubted cases of appendicitis, even with perforation, that show a low leukocyte count. After gangrene occurs, the count is apt to drop. It is believed that the resistance to infection in such cases is greatly lowered, for the mortality is very high. L. Muller* says:

"In low leukocyte count the appendices were found in hidden positions or surrounded by periappendical adhesions. Eight and one-tenth per cent of 640 cases had counts of 6,000 to 10,000. Stimulation of bone marrow in these cases is slight."

The Schilling differential count is most helpful in interpreting the low leukocyte counts, which might otherwise be very misleading. When the staff and juvenile forms are increased much above normal in a low leukocyte count one's suspicions should be aroused that there is severe trouble brewing. The absence of eosinophils also is quite characteristic, an increased eosinophilia pointing rather toward an infection of the ovary or fallopian tube on that side. Sedimentation rate is of comparatively little value.

Nausea and vomiting, slight rise of temperature, and an increased pulse rate are too frequent in children to be very significant in themselves, but should be present in conjunction with the points noted above to enable us to arrive at a final diagnosis. Sylvestre reports that of 1,000 consecutive cases of children coming to the hospital on account of pain in the abdomen only 15 per cent proved to be operative cases. He records some 69 different diseases causing pain in the abdomen, and doubtless others can be added from each one's experience.

*Beitr. Z. Klin. Chir., **155**:467, 1932.

When we have decided that the patient has acute appendicitis, we are faced with the problem of a prompt operation or symptomatic treatment. The answer will vary with the experience and judgment of the physician. If the case is recognized early, surely an operation offers the least risk. If it is a catarrhal appendicitis and is not seen until some days have elapsed and the general symptoms are clearing up, certainly an operation may be postponed and performed in an interval with the minimum of risk.

Between these two states lies no man's land, and the decision must be determined by many considerations which after all must be evaluated by the physician and surgeon in the case. But the writer believes that drainage in the presence of a peritonitis with the least possible trauma and the maintenance of the Fowler position will prove the better plan of treatment in children.

DISCUSSION (*Abstract*)

Dr. J. Buren Sidbury, Wilmington, N. C.—The treatment of acute appendicitis in children is very clear cut. As soon as a definite diagnosis is made surgical removal should be done, unless there are other diseased conditions which contraindicate surgery. An acutely inflamed appendix in a child is much more apt to rupture than in an adult. Procrastination even for a few hours may mean the life of the child or a prolonged postoperative peritonitis.

The differential diagnosis of acute appendicitis in children is not always easy. The condition does not run true to form in many cases. The typical signs of abdominal pain, nausea and vomiting, fever, leukocytosis and rigidity are not always present. However, when a child has acute abdominal pain which is of a few hours' duration associated with abdominal rigidity, even though it be slight, we should think of appendicitis.

A high fever and loose stools in a suspected case are evidence against appendicitis rather than favoring it.

If I may I wish to report briefly two cases that were a little out of the ordinary.

A boy of 4 years, after a peaceful night, rose at 8:00 a. m., was unable to void and complained of pain when attempting to void. The temperature was 99°. There was slight tenderness over the bladder region and in the right lower quadrant; no rigidity. Blood examination at 9:00 a. m. showed 12,400, white cells with 80 per cent polymorphonuclears. At 9:30 a surgical consultation was held and operation for appendicitis advised. The patient was operated upon at 10:00 a. m. and a ruptured appendix found. The abdomen contained considerable turbid fluid with foul odor. The boy made an uneventful recovery.

A boy of 10 years suddenly at 2:00 a. m. developed acute abdominal pain, with no nausea. He was seen at 8:00 a. m., when he had a temperature of 99°. Physical examination was negative except for tenderness in the region of the gallbladder. There were no other areas of tenderness and no rigidity. He was left in the hospital during the day and three blood counts

were made, all of them ranging between 8,000 and 9,000 with polymorphonuclears 60 to 65 per cent. His urine was negative. He went back to the beach that night because he felt well. The pain returned again at 3:00 a. m. the following day and he was brought back to the hospital at 7:00 a. m. and was kept under observation for three days before operation. The symptoms changed very little in that time and an operation was advised. At operation an inflamed appendix, situated in the region of the gallbladder, was removed and no further symptoms have been complained of since the operation three years ago.

It is the duty of the physician to continue to preach the doctrine of no laxatives in "stomach ache" in children. Tell the mothers they may irrigate the bowels, but refrain from castor oil and calomel, the usual remedies.

Dr. Roy E. de la Houssaye, New Orleans, La.—I should like to mention a case of appendicitis in a boy of 9 years. Following typical symptoms the child was operated upon. The appendix was found on the lateral side of the cecum held down by adhesions, being definitely edematous and very tense and enlarged. It was gradually delivered so that it could be completely visualized by dividing the adhesions and meso between clamps. It was removed by the usual technic by clamps, ligating with chromic catgut. At this stage, during closure of the peritoneum, the patient began to have convulsive seizures and rapid closure was done, the convulsions being controlled by intravenous sodium iso-amylethyl barbiturate. During convulsions a quantity of dark brown and black material was regurgitated which, on test, showed occult blood. The patient made an uneventful recovery.

Dr. Warren Cole, St. Louis, Mo.—All of us are aware of the fact that appendicitis in children is a more serious disease than in adults. There are two possible explanations for this. In the first place there are fewer cases of the so-called chronic recurrent appendicitis in children than in adults. A more serious feature is the fact that the peritoneal cavity of the child does not appear to have resistance to the infection after an appendix has ruptured. Dr. Barbour has called attention to the rising mortality in appendicitis. A year or so ago Dr. E. L. Keyes made a study of the patients with appendicitis in the Barnes and St. Louis Children's Hospitals. He noted that in the Barnes Hospital, where only adults were treated, the mortality was 2.16 per cent, whereas in the St. Louis Children's Hospital the mortality was 7.98 per cent. This increased mortality in children is accounted for by the fewer cases of mild chronic appendicitis and the high mortality in ruptured appendicitis. The mortality of appendicitis with peritonitis was 38 per cent in children and 19 per cent in adults. These figures are similar to those presented by other observers. The mortality of any patient with rupture of the appendix with abscess formation is, of course, much lower. This high mortality in late appendicitis obviously makes it exceedingly important that the patient be seen and treated adequately before the appendix has ruptured. Four factors present themselves as important in the reduction of the high mortality. (1) The public must be educated to refrain from administration of cathartics when the child complains of pain in the abdomen. It has been demonstrated repeatedly that the mortality of patients with appendicitis who received cathartics during the attack was much higher than those not receiving cathartics chiefly because of the high incidence of perforation. The public must also be trained to consult a physician when the child complains of abdominal pain. (2) The physician himself must be qualified to make a diagnosis of appendicitis in its early stage before perforation has occurred. (3) Adequate preoperative care must be administered and patients who have vomited for a day or two must receive adequate subcutaneous fluid and perhaps intravenous glucose before operation. (4) Adequate postoperative care may likewise be a life-saving procedure. The maintenance of fluids with adequate rest by narcosis, intravenous glucose, and so on, are exceedingly important in the treatment of peritonitis.

Dr. Barbour (closing).—A sudden cessation of pain should arouse a suspicion of rupture of an inflamed appendix or gangrene in the presence of other confirmatory symptoms and calls for an immediate operation. Of course there is the possibility of fatigue of the nerve carrying the sensation, but this secures relief of the pain only for a short interval.

It is particularly important to realize that the undeveloped structure of the appendix predisposes to rupture and that the attacks are fulminating and the diagnosis must be made very early if possible.

A familiarity with child psychology and an understanding approach to the child is almost as valuable as a thorough scientific knowledge of the appendix.

Unless one has the gift of intuition he had better practice on adults.

TWO UNUSUAL CASES OF ANEMIA IN CHILDREN*

By L. L. Lee, M.D.
San Antonio, Texas

Symptomatic blood changes in children are much more common than is generally recognized. These changes are not nearly so significant as they are in the adult. The hematopoietic response, like the temperature in children, is often quite dramatic. Showers of young blood cell forms may show up in the peripheral blood of a child without any serious cause. This must be kept in mind when one is interpreting the laboratory description of a child's blood. Since the brilliant work of Whipple and his associates in 1923, of Minot and Murphy in 1925 and Castle in 1929, great interest in anemia has been stimulated and the trend of thought almost revolutionized. The study of the morphology and

*Read in Section on Pediatrics, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

the hemoglobin content of the red cells has brought about a change of classification to macrocytic, normacytic, microcytic, hyper- and hypochromic anemias. This classification has taken the place of the old primary and secondary anemias. In San Antonio by far the largest number of cases of anemia in children are caused by infection and nutritional deficiencies. These causes seem to be general, and geographical situations are of little influence except in places where certain types of infections are more prevalent.

I wish to report two unusual cases that have come under my care during the past twelve months, the first, a case of acute hemolytic anemia, a condition first described by Max Lederer in 1925.

CASE SUMMARY

This child, aged 2½ years, was brought in on August 26, 1935, because of suddenly developing hemoglobinuria, jaundice, anemia and fever. His past and family histories were irrelevant except for the fact that it had been noted that he had had a very large head all his life.

The present illness began on August 24, two days before admission, when he became irritable and developed fever in the afternoon. That evening he had a poor appetite and later in the night he had a chill, followed by a rise in temperature to 103.6° F. (rectal). That night he slept poorly and the next morning his parents noticed that his urine was almost black in color. He continued to have fever and a poor appetite and later in the day he began to look sallow, pale and slightly jaundiced. These symptoms persisted until the time of entry into the hospital.

Examination revealed an over-developed, well-nourished boy of 2½ years, extremely pale and critically ill. His skin was waxy and both skin and sclerae were moderately jaundiced. The lips, mucous membranes and nail beds were extremely pale, but otherwise normal. The lungs were clear. The heart was rapid, about 180 beats per minute, but not enlarged. There were no murmurs. The abdomen was soft and the liver and spleen were not enlarged. Reflexes and extremities were normal.

Laboratory data on admission: the urine was port wine color, acid, and showed a moderate trace of albumin, and many granular casts, red blood cells and blood pigment granules. The blood showed 35 per cent hemoglobin (Sahli); 1,550,000 red cells and 15,000 white cells with 60 per cent polynuclears, small lymphocytes 27 per cent, large mononuclears 6 per cent; culture, negative; fragility test normal. The icterus index was 75; van den Berg, indirect 5. The stool was bile-stained, with a trace of blood. No ova or parasites were found. Blood smears were negative for malaria, spirochetes and other parasites.

The patient was given a transfusion of 75 c. c. citrated blood after admission and was given a fluid diet. The following day the hemoglobinuria had stopped and the patient appeared to be somewhat improved. However, his fever continued and his red cells were down to 1,330,000. He was again transfused, being given 150 c. c. of citrated blood from the same donor. The transfusion was followed by a transient reaction with a fever of 104° F. (R) and 10 or 12 mild convulsive seizures, each lasting a few seconds. The following day his urine was straw-colored, with a moderate trace of albumin, rare hyaline casts and pus cells and a few red cells. His blood picture showed 1,225,000 red cells, hemoglobin 35 per cent (Sahli), white cells 31,000 with polynuclears 73 per cent, small lymphocytes 19 per cent, large mononuclears 7 per cent, and eosinophils 1 per cent. The smear showed aniso- and poikilocytosis, diffuse polychromatophilic cells, nucleated red cells and stippled cells. Accurate differential counts of these cells were not made. The jaundice was rapidly disappearing, but on this day, August 28, the patient was comatose and appeared to be in very poor condition. His liver became palpable 3 cm. below the costal margin; the spleen was not felt. He was again transfused and as he appeared to have derived as much benefit from the small as from the larger transfusion, the amount was again 75 c. c. citrated blood from a second donor. The next day, August 29, the patient appeared much brighter. In the morning his red cells were 1,615,000 and by afternoon they were 1,680,000. There was no essential change in the white cell count, hemoglobin or stained film. His pulse had slowed to about 100 per minute and a systolic heart murmur was heard. On account of the evident improvement, the patient was not transfused on August 29, but on August 30 his red cells had dropped back to 1,510,000 with no change in the other elements. On that day he was given his fourth transfusion, 75 c. c. of citrated blood from the original donor. The next day his hemoglobin was 38 per cent and red cell count 1,900,000. He was much brighter and in every way greatly improved. He maintained the same blood level on September 1 and on September 3 showed a gain to 40 per cent hemoglobin, 2,150,000 red cells, 10,500 white cells, polynuclears 46 per cent, small lymphocytes 44 per cent, large mononuclears 6 per cent, and eosinophils 4 per cent. The stained film still showed moderate aniso- and poikilocytosis, with frequent nucleated red cells, polychromatophilic and stippled cells.

The urine was essentially normal. X-ray films of the long bones showed normal centers of ossification.

On September 4 the child appeared fairly bright mentally. He was almost fever free. His appetite had returned, his pulse had slowed to 120 per minute, his liver had receded to normal size and his spleen was still not palpable. As he appeared to be doing very well, he was discharged to return on September 6, 1935. At this time his red cells were 2,450,000 and hemoglobin 70 per cent. On September 20 the hemoglobin was 90 and red cells 4,150,000.

This case is almost exactly like those described by Max Lederer[1 2 3 4] in 1925, with sudden onset, high temperature, gastro-intestinal upset, extreme toxicity and anemia, jaundice, hemoglobinuria and leukocytosis. The patient

completely recovered after four transfusions of modified blood. The blood picture was very much like the exacerbation or crisis of pernicious anemia. The young forms of the myelocyte series suggested leukemia.

This was a severe case of hemolytic anemia with jaundice of the Lederer type.

(1) There was sudden onset with vomiting, high fever, jaundice, leukocytosis and severe anemia.

(2) Very rapid and extreme blood destruction occurred.

(3) There was hemoglobinuria.

(4) The patient recovered after four transfusions of modified blood.

(5) The etiology is as yet unknown.

Case 2.—B. B., a girl 6 years old, was brought to my office January 28, 1935. The child was extremely pale and gave the following history. Father, mother and younger sister were all perfectly well and healthy. Grandparents on both sides were living and healthy. She was a full-term baby, of normal delivery, who weighed 7½ pounds at birth. The mother's attention was called to the paleness of the child when it was eight months old, but she was not carried to a pediatrician until she was thirteen months old. The child had been almost exclusively on mother's milk up to this time. No vegetables or cereals had been given, no cod liver oil, some citrus fruit juices.

Diagnosis at this time was nutritional anemia due to milk feeding and lack of other necessary foods. The red blood cell count at this time was 3,500,000, hemoglobin 70 per cent, and white cells 7,050.

At eighteen months the child was carried to a pediatrician in Austin, Texas, and a history of fainting and blue spells was given. The red cell count at this time was 1,500,000. X-ray showed the heart to be much enlarged and the child was in a desperate condition. Diagnosis of anemia and possible congenital heart disease was made. The child gradually improved and after three months had no more sinking spells; the blood count remained about the same. The father being a school teacher and moving from place to place for a period of about four years, no records were kept. During this time the child had whooping cough and measles. The mother states that during this period there had been practically no change in the child's color or condition.

She weighted 38 pounds 5 ounces, height was 44½ inches. The child was fairly well nourished, the muscles were fairly firm and she appeared quite active. The head was negative, lungs negative, heart apparently considerably widened and a loud systolic murmur was heard. In the abdomen, the spleen was palpable about three finger breadths below the costal margin. Skin and mucous membranes were extremely pale.

The red blood cells on this date were 900,000, white cells 6,500, polynuclears 48 per cent, lymphocytes 37 per cent, eosinophils 8 per cent, transitionals 2 per cent, large mononuclears 3 per cent, hemoglobin 16 per cent, and color index 1. The urine was negative and stool negative for parasites or ova. A working diagnosis of nutritional anemia was made and the child was put on 15 grains of iron ammonium citrate three times a day, green vegetables, eggs, liver, red meats, fruits, and one pint of milk per day.

Blood counts were made at about four-week intervals from January, 1935, up to November 1. Ten counts have shown an average of a little over 900,000 red cells for this entire period. The highest count found was 1,120,000 and the lowest 800,000. The Wassermann is negative.

On September 9, 1935, there were 2 per cent reticulocyte cells, volume index was 1.25, platelets 300,000, saturation index 0.80, average diameter of red cells was 8.15, hemoglobin 20.5 per cent, color index 1. On October 9 a sternal puncture was made and a specimen of bone marrow obtained by suction. Examination of this bone marrow was made by the Hamilton-Stout Laboratories in San Antonio, 1,000 cells being counted with the following result:

		Per Ct.	Per Ct. (Reich) Normal
	Megakaryocytes	1.0	
Granulocytes	Segmented	22.5	25
	Juveniles	16.5	5
	Stabs	15.0	10
	Myelocytes	16.5	10
	Promyelocytes	3.2	10
	Myeloblasts	1.7	2
	Eosinophils	4.2	1
	Lymphocytes	0.4	10
	Erythroblasts	20.0	25
	Monocytes	—	1
	Plasma cells	—	1

This child has had 32 c. c. of concentrated liver extract hypodermically, two pounds of liver concentrate containing both factors, and six intramuscular blood injections of 10 c. c. each, given every other day. She has been fed red bone marrow and has taken cod liver oil at intervals all her life. There has been no reticulocyte response during the administration of any of these remedies.

The blood count on November 14, 1935, was: white cells 6,000, neutrophils 45 per cent, lymphocytes 44 per cent, eosinophils 8 per cent, monocytes 3 per cent, fragility beginning at 0.40, complete at 0.32. Coagulation and bleeding time were normal, icterus index was 6 per cent, and red count 1,090,000.

I am unable to classify this case. The history, blood picture and the activity of the child do not resemble any of the classified anemias of childhood that I can find. The etiology is unknown.

REFERENCES

1. Lederer, Max: Amer. Jour. Med. Sci., **170**:500, 1925.
2. Lederer, Max: Amer. Jour. Med. Sci., **179**:228, 1930.
3. Holst, P. F.: Acta. med. Scandinav., **27**:469, suppl. 23, 1928.
4. Douglas, A.: Brit. Med. Jour., **2**:526, 1933.

DIAGNOSTIC MEASURES IN ATOPIC INFANTILE ECZEMA*

By HERBERT J. RINKEL, M.D.
Kansas City, Missouri

The most vexing problem of infantile eczema is not the clinical or differential diagnosis, but rather that of therapeusis. Hill[1] emphasizes the importance of the subject of this paper with the statement: "The treatment of eczema may be summed up in six words: find the cause and remove it."

We are primarily concerned at this time with the diagnostic measures to be employed in those cases of eczema where the disease entity is definitely established. However, it is worthy of mention that the diseases most commonly confused with eczema have been scabies, trichophyton infections and dermatitis herpetiformis.

FACTORS INVOLVED IN THE ETIOLOGIC DIAGNOSIS

There are a number of prerequisites to success in determining the specific precipitating causes of an eczema.

(1) One should assume, for the purpose of study, that all cases of infantile eczema are allergic in nature. In considering allergy the mechanism of reaction is important. While infantile eczema is atopic in nature, it may be complicated by contact sensitization.

(2) Before allergy can be dismissed as a factor in a case of suspected eczema the existence of hypersensitiveness must be disproved, and this involves a complete study of the effect in ingesta and contactants.

(3) Another important prerequisite is the understanding of the specificity of the allergen and its etiologic importance in whatever form or amount it is consumed. The physician must train the patient or the parents to be food conscious. They must learn to consider the content of the food before it is served and not at 3:00 o'clock in the morning when the babe is crying with a new eruption of eczema. The parents must be taught to realize that children often obtain food from other sources than their own table. They should be instructed that specific foods are the precipitating cause of eczema, and that very small amounts of food may be sufficient to produce trouble. In short, either the patient or his supervisors must know that in order to effect clinical cure elimination must be perfect, and to this end the patient must be equipped both by training and physical means to cooperate with the physician in every detail.

(4) Since atopic eczema, in most cases, is caused by ingesta, the diagnosis of its specific causes is, in reality, the diagnosis of food allergy. In order that the nature and mechanism of food allergy may be better understood the more important of these factors will be considered at this time.

(1) *Botanical Classification of Foods.*—Vaughan[2] first emphasized the practical importance of the botanical classification. For instance, when one eliminates beans, he should also avoid peas, lentil and peanuts because they also belong to the leguminosae family. Forty per cent of the sensitizations in ten consecutive cases of eczema were complete for the botanical food family or to every member which was tried, and 60 per cent of the sensitizations were limited to one member of a botanical food family. In other words, out of every five sensitizations, two were complete and three were incomplete for the botanical family. This relationship must be considered, in testing, in elimination of foods, and in the preparation of diets. In our experience, the more common causes of eczema have been the cereals, citrus fruits, legumes, the potato-tomato family, spinach, milk, and eggs in order as named.

(2) *The Relation of Pruritus to Ingestion of Specific Foods.*—There is a definite interval between the time of ingestion and the onset of pruritus, as evidenced by scratching. Likewise, there is a definite duration of this symptom, following a single intake of each food. The pruritus of eczema is dependent upon the presence of a specific irritating allergen or allergens within the sensitized cells of the skin rather than strictly upon the morphologic changes in the skin. The clinical study of this symptom in relation to ingestion and contact is the most important diagnostic measure at the command of the physician who does not wish to or cannot use skin tests or the leukopenic indices.

Since the occurrence of pruritus of eczema following ingestion is an evidence of food sensitization, its occurrence and clinical course will be identical to that of other symptomatic evidence

*Read in Section on Pediatrics, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

of food allergy. There is a period of hypersensitivity following elimination which in turn is followed by successive stages of decreased reaction until finally tolerance occurs. There will be no pruritus following ingestion of the specific foods when this tolerance appears. New sensitizations may develop in the course of treatment: foods which have been used rarely or not at all are often increased in the diet following elimination of the more common foods, and they then become allergenic. Clinically, one can differentiate by the onset of symptoms whether the eruption is that due to an error in the diet or to a newly developing sensitization. The clinical effect of the food may be modified by physical changes: raw fruits and vegetables are often a cause of symptoms while the same ones cooked are not.

THE DIAGNOSTIC MEASURES

(1) *Skin Testing.*—The important consideration in skin testing is the knowledge of its degree of inaccuracy rather than its supposed finality. In a series of seven consecutive cases of eczema in which every specific cause was demonstrated and clinical cure was effected, it was found that of the 83 causes of eczema only 26 had given positive skin tests, an accuracy of 31 per cent for the group. However, in no case was every cause of eczema demonstrated by testing. The inefficiency of skin tests becomes more striking when we note that there were 77 skin reactions which had no clinical significance in the treatment of these cases. Further, it was found that scratch testing revealed almost three times as many specific allergens as did intradermal testing.

The nearer the approach to a complete diagnosis of the precipitating causes of eczema, the lower will be the per cent accuracy of skin testing. Skin testing is, therefore, but the initial step in the diagnosis of eczema, or any other food allergy. About 20 per cent of these patients will give no skin reactions at all and of these reactors there will be six to seven of no consequence as compared to three that are actually a cause of symptoms. Added to this is the observation that there are twice as many causes of eczema which will fail to give skin reactions as there are that do give reactions.

(2) *Elimination Diets.*—In 1928 Rowe[3] published a series of "elimination diets" which he revised in 1934.[4] To demonstrate their efficiency as a diagnostic measure, the actual causes of ten cases of eczema are listed. In Chart I, it will be seen that nine cases could have been benefited by trying all of the diets. One often does better if he devises individual elimination diets for each case after considering the findings obtained by the clinical and dietary history and skin testing.

THE DIAGNOSTIC EFFICIENCY OF ROWE'S REVISED ELIMINATION DIETS IN ECZEMA

Case No.	Diet 1	Diet 2	Diet 3	Diet 4
1	Beet Carrot Spinach	Peas	Beet Carrot S. potatoes Potatoes	Milk
2		String beans	String beans	Milk
3	Carrot		Carrot	Milk
4	Grapefruit	Rye String beans Tomato Corn Chicken Peas	Grapefruit String beans Tomato	
5	Beet Lemon Lettuce Grapefruit	Asparagus Prune String beans	Beet Lemon String beans Grapefruit	
6	Spinach	String beans	String beans S. potatoes	
7	Lettuce Lemon Grapefruit	Tomato	Tomato Lemon Grapefruit	
8	Spinach Pear	String beans Tomato Chicken Asparagus	String beans Tomato Potato	
9	Lemon Rice Grapefruit	Corn Tomato Peach Prune	Lemon Tomato Peach Grapefruit	
10	Rice		Potato	

In nine instances (22.5 per cent) these diets would have been satisfactory, and in thirty-one instances (77.5 per cent) failure would have occurred. However, if Diet 4, which consists of milk, had been used, seven cases (70 per cent) would have cleared up at once. If these diets were revised in recognition of botanical food groups and without duplication their efficiency would be increased. In Case 4 there would have been difficulty with both Diets 2 and 3 on account of string beans. In Case 3 the same is true of carrot, which is used in two diets, 1 and 3. Again in Case 4 the sensitivity to grapefruit would complicate Diet 1. Cases 6 and 7 are complicated by string bean and tomato sensitivity due to their being used in two diets.

This would cause us to have a total of five

diagnostic errors due to duplication of foods in the four "elimination diets."

(3) *Food Diaries and Symptom Records.*—A record of the actual foods ingested and the clinical course of symptoms in conjunction with the prescribed diet, whether it is arranged upon the basis of skin testing or is strictly an elimination diet, is a valuable and practical diagnostic measure. There are several important considerations in interpreting these charts: first, the genetic relationship of foods; second, the interval between ingestion and the occurrence or increase in symptoms; and third, the duration of symptoms. It has been found satisfactory for the parents to interpret the occurrence and intensity of pruritus by the amount of scratching that the child does. Older children may report the occurrence of pruritus, but even in these instances it is better to observe the patient to confirm the degree of itching by the evidence of scratching (excoriation, lichenification, and so on).

During the past three years 66 per cent of all the causes of eczema under our study have been determined by means of our daily diet and symptom record,[5] which was devised to be used along with the food diary suggested by Vaughan.[5] It is not essential, but certainly much easier for the physician to use both sheets together. Such records will be of value only when they are kept accurately.

No better criteria of the efficiency of this study can be given than the statement of the fact that twice as many causes of eczema have been found with the aid of the food diary and symptom records as have been found in these same cases by skin testing (scratch and intradermal). The accuracy of this statement was confirmed when leukopenic studies were subsequently made for these same foods. This test is a more recent procedure in the diagnosis of allergy. It is probably the best, particularly when one has had sufficient experience with his own series of blood counts and methods of charting curves, to interpret the clinical significance of the various types of leukocytic response to foods.

(4) *The Leukopenic Index.*—The leukopenic index originally described by Vaughan[6] is a series of total white cell counts made as follows: two leukocyte counts are made at ten-minute intervals before ingestion of the test food to determine a normal. Counts are then made at 20, 40 and 60-minute intervals after ingestion of a test food. One may, however, make counts at 15-minute intervals for an hour after ingestion with a final count at an hour and a half. It has been found that exercise and emotional factors, as well as the amount of food taken, its preparation, temperature and the rate at which it is eaten will all affect the leukocytic response. Therefore, these factors should be made as constant as possible.

The interpretative value of the counts is based upon two features: (1) the variation above or below the initial count, and (2) the character of the curve obtained by plotting the series of counts. For this reason one should adopt a standard interval, either 15 or 20 minutes, and develop an intimate knowledge of a series of such counts in clinically controlled cases.

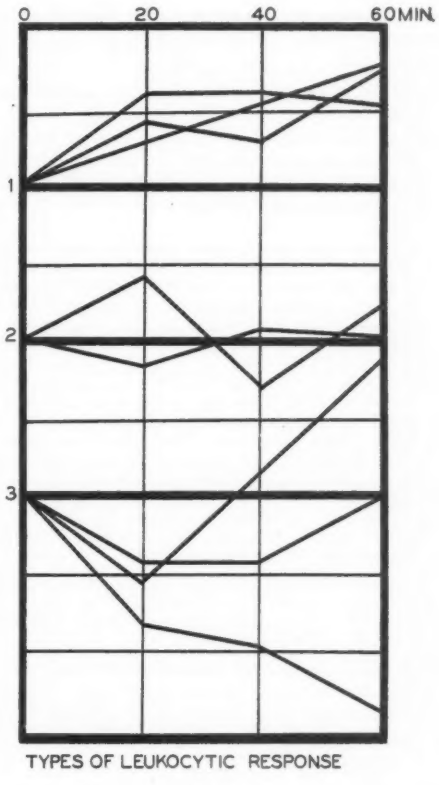


Fig. 1

Types of curves obtained running counts at 20-minute intervals for a period of one hour. Group I indicates a leukocytosis (negative leukopenic index) and these are obtained with foods which do not cause allergy. Group II indicates an indeterminate result. Group III indicates a leukopenia (positive leukopenic index). In the great majority of instances these foods produce allergic symptoms. The ordinates represent 1,000 cells, the abscissae 20 minutes.

For the purposes of clinical application the leukocytic responses may be grouped under three general types:

(1) The negative leukopenic index, a leukocytosis of at least 1,000 cells at the peak, and persistent in some degree for at least an hour. This would include curves of Group 1 (*Fig. 1*). Clinically these counts are not associated with symptoms.

(2) The indeterminate leukopenic index: a change in the leukocytic count of less than a thousand during the first hour. This group will include the curves in Group 2 (*Fig. 1*). Clinically there is little information gained from this response.

(3) Positive leukopenic index: a loss of more than 1,000 cells. This will include curves in Group 3 (*Fig. 1*), and as 90 per cent of these indices are associated with clinical manifestations of hypersensitiveness, one may from a practical standpoint consider this type of response indicative of allergy. The clinical application of the leukopenic index is illustrated in the following case record:

Case 1.—A girl, aged 5 years, was first seen for eczema of four years' duration on May 5, 1935. The history was irrevelant from the standpoint of specific factors. The eruption was chronic in appearance, exhibiting considerable thickening with lichenifications and fissures along with excoriations due to scratching, and it was typical in its situation, involving the neck, cheeks, cubital and popliteal spaces. The patient had been tested repeatedly, but had never given skin reactions and hence the eczema was suspected to be due to some other factor than food. The patient was eating 24 foods belonging to 14 botanical families. Four of these groups could be eliminated without any ill effect. Tests were necessary then with the remaining ten food groups. Leukopenic indices were made for these foods and the concomitant symptoms were observed. The results are summarized in *Fig. 2*.

The patient made prompt and satisfactory improvement following the use of a diet limited to the foods giving a postingestive leukocytosis. Further additions were made by clinical trials alone.

This patient had been treated for several years without results and allergy had been "eliminated" upon failure to obtain skin reactions. In not every case will one be able to make such rapid and effective progress by means of the leukopenic index and clinical observations, but in general these procedures are very efficacious diagnostic measures.

SUMMARY

Briefly, the clinical value and use of the diagnostic measures in atopic eczema may be summarized:

The history evaluates three facts: (a) the time of onset of symptoms and (b) the diet until several weeks antecedent to the eruptions, and (c) the present diet.

Skin testing is done by either scratch or intracutaneous methods, or both, including all foods used and those that one might wish to add to the diet. These tests will aid one in arranging the therapeutic program, but are not to be considered as more than preliminary diagnostic measures.

Elimination diets are to be individually devised upon the basis of skin testing and the history and should conform to the botanical classification of foods. By this means etiologic foods may be entirely removed, but more often they are only limited, sufficiently so that one can make clinical observations of interpretative value.

Clinical observation constitutes the method of final analysis of a case. It concerns itself with a study of the relation of pruritus, evidenced by scratching, to specific foods in the diet.

The leukopenic index may be used to supple-

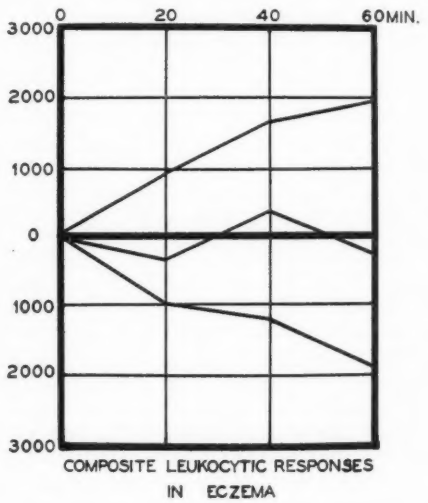


Fig. 2

Composite curves of leukocytic response to foods in a patient with eczema. The ordinates represent 1,000 cells, the abscissae 20 minutes. Clinical cure was effected by eliminating the foods giving positive leukopenic indices.

ment any of the laboratory procedures, or it may be used alone to formulate an initial diet, though this is somewhat laborious. It, too, must be used in connection with clinical observations, since there are indeterminate reactions with many foods and not all those giving positive indices are actually a cause of symptoms.

CONCLUSIONS

The diagnosis of the precipitating causes of atopic eczema is essentially the diagnosis of food allergy. The possibility of allergy in any case of "eczema" cannot be eliminated until all these diagnostic measures have collectively indicated that there is no relation between symptoms and the diet.

The accuracy of skin testing is approximately 30 per cent in those cases where there are skin reactions; while 20 per cent of the eczema patients do not give any reactions. The scratch method is superior to the intracutaneous method on a basis of specificity.

Elimination diets must be used with due regard to the botanical relationship of foods, since two out of every five sensitizations are complete for the botanical food group.

Diet and symptom records in our hands have revealed twice as many causes of eczema as skin testing and represent a most valuable diagnostic measure. Clinical observations are a necessary procedure in every case as a check for all laboratory tests employed.

The leukopenic index is of distinct aid, since it may be used regardless of the clinical state of the eczema. Its accuracy has been found to be the same in eczema as in other types of food allergy, being approximately 84 per cent.

BIBLIOGRAPHY

1. Hill, Lewis Webb: Chronic Atopic Eczema (Neurodermatitis) in Childhood. J.A.M.A., **103**:1430-1433 (Nov. 10) 1934.
2. Vaughan, Warren T.: Food Allergens. I. A Genetic Classification with Results of Group Testing. Jour. Allergy, **1**: 385, 1930.
3. Rowe, Albert H.: J.A.M.A., **91**:1623, 1928.
4. Rowe, Albert H.: Amer. Jour. Digestive Dis. & Nutrition, **1**:387-392, 1934.
5. Vaughan, Warren T.: Allergy, 2nd Edition. St. Louis: C. V. Mosby Co., 1934.
6. Vaughan, Warren T.: (a) Food Allergens. III. The Leukopenic Index: Preliminary Report. Jour. Allergy, **5**:601 (Sept.) 1934; (b) Further Studies on the Leukopenic Index in Food Allergy. Jour. Allergy, **6**:78 (Nov.) 1934.
7. Rinkel, Herbert J.: The Leukopenic Index in Allergic Diseases. Read before the Thirteenth Annual Meeting of the Association for the Study of Allergy, Atlantic City, June 11, 1935 (unpublished).

DISCUSSION (*Abstract*)

Dr. Carroll M. Pounders, Oklahoma City, Okla.—The pediatrician has, of course, to do a great deal of worrying about eczema. Its incidence appears to be on the increase. This, I think, may be because there are more bottle-fed babies, stronger formula are used and the various foods are started earlier.

Certain things help us to determine those cases that are allergic. In the first place, we have the fact brought out by Dr. Rinkel and others that at least the majority of them have this etiological background. It is important to remember that eczema is only one manifestation of allergy and if we look into the family and personal history we are quite likely to discover others. In the relatives it may be in the form of eczema, hives, asthma, hay fever or migraine. The baby himself is apt to show distinct evidences of trouble before the skin condition appears. His first contact with atopic substances is through the mucosa of the gastro-intestinal tract. The lack of tolerance here manifests itself through restlessness, vomiting, colic and loose bowels. As a matter of fact, if it were not for allergy I do not believe we should have many troublesome feeding cases during the first year. There may be some eruption about the mouth following the taking of the food reactors. These might be termed primary allergic reactions. Later the field of action is shifted from the frontier to the interior. The food is tolerated by the gastro-intestinal tract, but the products of digestion set up reactions where they come into contact with certain types of body cells, for example, in the skin, the respiratory mucosa, or the meninges. In these young infants it happens to be the skin, as a rule. I believe that crusting of the scalp or the so-called "cradle cap" is a mild degree of eczema. So a careful history means much. Another worthwhile observation is that allergy appears to be closely connected with the reactions of the nervous system and nearly all these infants would be classed as "nervous."

I do not believe the average pediatrician can accomplish much with skin tests. These require good, fresh materials, faultless technic and careful interpretation by one who is well trained in the work. The leukopenic index does not present such technical difficulties and is likely to prove of more practical value. But much can be learned by manipulating the foods. One might look for some improvement when a case in a bottle-fed baby is put on evaporated milk which has been cooked a long time. Sugars containing wheat germ, yeast or malt may be at fault; also orange juice and cod liver oil. Later, with a more varied diet, one may observe improvement or a disappearance of the symptoms when one or more foods are excluded. Conversely there may be an exacerbation of the symptoms following ingestion of these foods.

I believe that by manipulating the diet, heating and breaking down such proteins as are present in the milk and eliminating others one can get at the cause of most mild cases. The severe and troublesome ones should have the benefit of the special knowledge possessed by the allergist with now and then some assistance from the dermatologist.

Dr. Hugh L. Dwyer, Kansas City, Mo.—It is probably safe to assume that all cases of eczema in in-

fancy are allergic in nature. It is also true, fortunately, that many cases of eczema can be treated successfully without "finding the cause and removing it." I believe that all of us have treated eczema successfully with local applications of keratolytic and antipruritic agents. I believe local measures are of very great value if they are carried out with some care and the medication changed from time to time as the condition warrants. One who expects to obtain a cure with a jar of ointment will probably be disappointed.

This in no way detracts from my respect for the study of allergy. Not enough attention is given to this phase of eczema treatment. It seems that allergy has fallen into disrepute just as it was getting a good start, because in the mind of the laity, and among some physicians, too, allergy is synonymous with skin testing. We should bear in mind that we can do a considerable number of allergy studies without ever doing a skin test.

It is refreshing to hear an allergist say that one of the most important considerations in skin testing is the knowledge of its degree of inaccuracy. Dr. Rinkel mentioned seven cases of eczema with 83 possible causes, only 31 per cent of which were detected by skin tests. And 77 reactions were obtained which had no clinical significance. Such a maze of contradictions can be interpreted properly only by the specialist in this branch of medicine. Allergists are not in agreement regarding the relative importance of various foods in the causation of eczema. In one section of the country skin tests show that cow's milk is the most frequent offender. In another section the allergists are equally sure that it is egg, and in another, wheat.

Dr. Rinkel's observations on the leukocytic response to ingested allergens are interesting. Inasmuch as the accuracy of this test is dependent upon emotional factors, exercise, the nature of the food, as well as the temperature and manner of taking the food, it seems that this test is not easy. Certainly in infants these factors constitute a very practical difficulty in the interpretation of this test.

The pediatrician will probably make the most of his allergy studies by way of diet elimination tests. These can be applied advantageously in early life because of the monotony of the diet. We have learned by experience that cow's milk heated to a high temperature loses some of its allergenic properties. I frequently resort to one of the powdered milks. In severe cases I have resorted to goat's milk and occasionally obtained a spectacular improvement.

In the breast-fed infant the problem of diet elimination is more complicated. Dr. W. O. Colburn, of Lincoln, Nebraska, has recently described a method of desensitizing the baby by the subcutaneous injections of minute quantities of mother's milk. He does not disturb the mother's diet. The milk is diluted with an equal quantity of water and heated on a water bath. Injections are made on alternate days, beginning with one minim and increasing gradually to ten minims. He has obtained very striking relief in some cases and this simple and apparently harmless procedure should be investigated by others.

UNUNITED FRACTURES*

By EDWIN W. RYERSON, M.D.†
Chicago, Illinois

The cause of the failure of union in fractures is still, in many cases, an unsolved problem. The calcium and phosphorus content of the blood is apparently an unimportant factor. Syphilis may ordinarily be discounted. The interposition of soft parts may delay union, but in most cases does not prevent union.

Infection, whether in compound fractures or following open operation, is definitely responsible for failure of union in some instances, but is not included in this paper.

Deficiencies in vitamins and disturbances of endocrine functions play no part in the usual cases of non-union.

What, then, can be the reason why, in normal and healthy individuals, a fractured humerus or tibia, placed in good position and retained in suitable apparatus, may completely fail to unite? We all know that a simple fracture which has been subjected to open operation will take longer to unite than after a closed reduction. The reason is that the blood clot, which supplies important nutrition to the osteoblasts, is sponged away during an open reduction, and that the periosteum, which provides a blood supply to the cortex, is usually stripped off from the bone more extensively than in a closed reduction.

These two factors are the only real differences between open and closed reduction in ordinary fractures, such as a fracture of a single bone of the forearm. Yet, all of us have seen such a fracture after a plain, open reduction, with no form of internal fixation, require four or five weeks longer to unite than would be expected if no open operation had been performed.

This, then, is probably a question of local nutrition only, and although such a fracture may unite slowly, it will, nevertheless, unite surely and strongly, with no real tendency toward a non-union. Some other factor must therefore exist when a fractured humerus or tibia, accurately reduced and held in apparatus for a long enough time, fails entirely to unite.

---

*Read in Section on Bone and Joint Surgery, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

†Senior Orthopedic Surgeon, St. Luke's Hospital.

In the fractures of the humerus, I agree completely with Watson Jones, who thinks that inadequate immobilization is the chief cause of non-union. It is not at all easy to hold a fractured humerus in absolute immobilization by any kind of apparatus. The Robert Jones humerus traction splint does not produce immobilization, nor does the Middeldorpf triangle, nor the Thomas splint. A plaster of Paris body cast, from the trochanters to the axillae, continued over the shoulders and down to the wrist, furnishes the nearest approach to perfect fixation, and yet, if you cut a narrow window over the fracture, you will be surprised to see how much the patient can move the fractured fragments.

This is also true in most cases of fracture of the tibia. In spite of the splinting action of an unbroken fibula and the aid of a long plaster of Paris cast, considerable motion can still be demonstrated in the fracture.

It is, then, quite possible that inadequate fixation may cause failure of union, but it is also true that the majority of fractured bones will unite in spite of inadequate fixation. We must therefore conclude that some individuals do not possess as much bone-forming ability as others do, and we are still uncertain as to whether the osteoblasts are too few or the osteoclasts are too many. The most striking examples of this peculiarity are seen in little boys whose fractured tibias fail to unite after many months of fixation. I have seen five or six such cases where open operations were performed when it was evident that no union could be expected by conservative treatment. In all of them the bones were in perfect apposition, but separated by a thin layer of white fibrous tissue, very firm, and resembling cartilage. This layer was carefully removed and a large bone-graft was applied across the defect. Months later non-union was again present and reoperation once more showed a similar layer of white cartilaginous tissue between the ends of the fragments. Evidently, the boy was unable to convert the fibrous tissue into bone.

Such cases as these might well be considered as of endocrine origin, and extracts of nearly all of the various glands have been tried in many instances and without success. The fact that these patients, in my experience, have all been boys, has made me wonder if some of the female hormones might be beneficial. I have not had an opportunity to experiment along this line. It would be interesting to administer ovarian extract, theelin, or some similar female hormone in a series of such cases, and it is worthy of note that practically all of these boys are readily cured by bone-grafting operations after they have reached the age of puberty.

This possible endocrine factor has no bearing upon the variety of ununited fractures which I wish to discuss in the present paper. In studying a long series of non-unions in healthy adults who have come under my observation, one outstanding feature in the history has been noted: a simple fracture of a humerus, a forearm or a tibia has been competently reduced, and competently immobilized for a reasonable period of time. Then, because union is not perfectly solid, an operation has been performed. In many of the instances, the bones have been wired; in others, Lane or Sherman plates have been used, or other forms of internal fixation. Again, after a period of immobilization, union has not occurred. The plates or wires are now removed, and after another interval a bone-grafting operation is performed, usually a short intramedullary splint or an Albee inlay, also too short. When this has likewise failed to produce a union, the surgeon and the patient are willing, and sometimes anxious, to have some one else take up the burden.

Now, do not misunderstand me. I do not mean that all fractures which are wired or plated fail to unite. It is quite certain that the results in many cases are wholly satisfactory, because, if they were not usually satisfactory, the wires and plates would long ago have been relegated to the scrap heap. Somebody, somewhere, must be just as successful with them as is Sherman, of Pittsburgh. I, myself, have used plates and wires with fine results in a few cases where I could not think of any better method, but I have also had failures.

The point I wish to make is that a rather large number of patients have come to me after the series of surgical adventures which I detailed above, and that a careful analysis of the histories has made me suspect that some of the cases were examples of delayed union rather than non-union, and that a longer period of immobilization might have produced a perfectly satisfactory union, without any operative work whatever. This is merely my own opinion, without any evidence except that I have seen many other cases where union was delayed far beyond the ordinary time, but ultimately became complete under prolonged immobilization.

The second point which I wish to make is that

when a fracture has definitely failed to unite, and evidently will never unite without operation, it is generally wise to use an autogenous bone graft of sufficient size and strength to provide its own immobilization with a minimum of external fixation by apparatus.

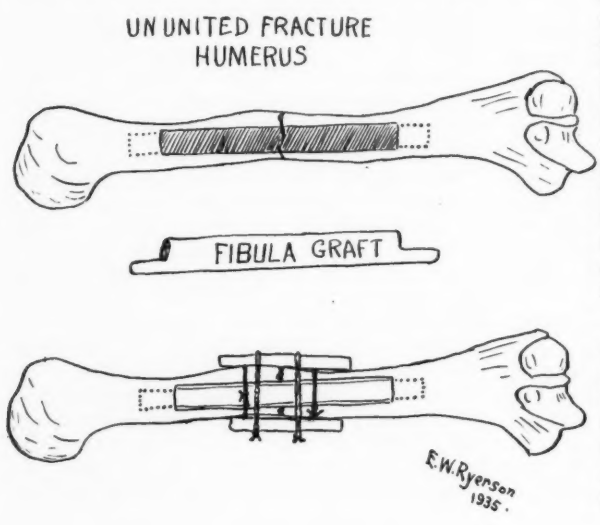
Wires, plates, screws, beef-bone pegs and similar foreign materials do not stimulate callus formation, and probably actually retard it, while autogenous bone-grafts furnish stimulation and some of the constituent materials for bone growth.

If, then, we could apply an autogenous bone graft of great strength and fasten it in place so securely that no plaster casts or splints or apparatus would be needed, we should have the ideal method of operation. This ideal, unfortunately, can seldom be attained. The only kind of bone graft which is entirely self-supporting is the long, intra-medullary graft, firmly driven into both fragments. The other types of grafts, such as the inlay, the massive onlay, the diamond graft and so forth, must be held in place by ligatures, sutures, bone screws or metallic fixation of some kind. This adds a definite and undesirable factor of risk to the operation from the greater possibility of infection and from the inhibitory effect of foreign materials upon bone formation.

From a mechanical standpoint, therefore, an intramedullary autogenous bone graft would furnish good stability if it were long enough and strong enough. A short intramedullary graft does not provide enough leverage to assure the desired stability, and a long one cannot be inserted by the ordinary technic. Furthermore, some of the bones are so small in diameter that the intramedullary graft of appropriate size will not be strong enough to stand the strain. This is particularly true of the humerus, the radius and the ulna.

Some authors have objected to the intramedullary graft on the theory that it interfered with union because it plugged up the medullary canal and prevented the free circulation of blood. This is purely an academic objection and has no scientific foundation. As a matter of fact, the more tightly the intramedullary peg is driven into both fragments, the more rapidly will union take place, because the immobilization of the fracture will be more perfect during the healing process. The new bone formation which causes the fracture to unite does not come from the medullary canal, but from the cortex, and, in my opinion, also from the periosteum.

Let us admit, then, that a strong intramedullary peg is mechanically sound and biologically harmless, but that in some situations it is impossible to insert a long enough or strong enough peg by the ordinary methods. This difficulty can be solved by cutting a long slot in both fragments, as in the Albee inlay method, and then drilling a hole still farther along in the shaft beyond the slot in each fragment. The peg is then cut so as to fit accurately in the slot, with a half-inch prolongation of smaller size at each end which can be driven into the holes beyond the slot. If this carpentry is carefully done, it is astonishing to see how firmly the fracture is held. A couple of strong chromic catgut ligatures are tied around the bones near the fracture, the two pieces of bone removed in making the slots are laid on either side across the fracture and similarly tied, and the wound is closed in the ordinary manner.



I have used this method in several cases of non-union of the humerus where other forms of operation had failed. In these cases the graft was made from the fibula, and the results were more satisfactory than by the massive onlay or the diamond graft technic, and the time of operation was

considerably reduced. My present belief is that the fibula furnishes the very best autogenous bone-graft wherever strength is required, as in the humerus, the tibia, the femur and the neck of the femur. I also feel that the simplest methods are the best, and that metallic and non-absorbable materials should be avoided whenever possible in the treatment of ununited fractures.

122 South Michigan Avenue

INDICATIONS FOR OPERATION IN RENAL STONES*

By R. M. LeComte, M.D.†
Washington, D. C.

Recent investigations into the part that vitamin deficiency[1] may play in the etiology of certain types of renal stones have led to a rather widespread belief among both physicians and laymen not only that stones may be prevented by appropriate dietary measures, but that many, if not all stones, may be caused to soften, disintegrate and perhaps be passed. The corollary of this is that a well developed impression is extant that renal stones are now not so much a matter for surgery as they are for dietetic and medicinal treatment. While these studies have removed a certain amount of cases from the need of surgical help, that number is relatively small and the availability of these new measures accentuates rather than minimizes the need for a thorough study of every stone-bearing individual.

Due to the number of factors that a patient with stone may present, it is not possible to formulate a rule that is sufficiently broad and flexible to cover all of the cases that come up, and accordingly it is impossible to bring the indications for treatment under headings that will at all approach an exact formula. The treatment of renal stone thus becomes an art, the proper application of which to the individual case requires not merely a clinical diagnosis based on renal pain and hematuria, but also an intelligent use of all of the methods of precision available to show the various circumstances that may influence treatment.

As a preliminary note it must be recognized that stones cause damage largely from the obstruction that they produce or from the infection that either precedes them or results from their presence and that, ordinarily, the influence of a stone on the tissues with which it is in immediate or close contact is of relatively slight importance. Also that these remote but inevitable consequences of the presence of a stone, obstruction and infection, act on a vital organ which will be destroyed by them if they are not controlled, and that this destruction may proceed so slowly and insidiously that neither the patient nor his physician may suspect the amount of damage being done from the clinical symptoms presented. Consequently, just as operative treatment of renal stone is seldom to be undertaken without an accurate evaluation of all the factors that are determinable, so non-operative or expectant treatment is not advisable unless, in addition to these careful studies, the cooperation of the patient in returning for periodic and sufficiently thorough examinations can be assured. In a given case it is often difficult to determine which of the two major complications is primary but, by a sufficiently thorough examination, the influence that they have on the problem at hand can be estimated well enough for practical purposes of outlining treatment. The damage done by obstruction is read largely from changes in the urogram and in depressed renal function, the hazard from infection mainly in the general reaction of the patient to it as expressed by fever. The existence of either one will aggravate the damage done by the other and accordingly, unless they can be quickly and adequately controlled by other means, operative removal of the stone causing them is indicated.

As soon as a diagnosis of kidney stone has been made it becomes necessary to determine whether the general condition of the patient is such that prompt operation is imperative, or whether time may be taken for a deliberate survey of all the features of the case and an orderly planning of the treatment to be used.

Systemic diseases which constitute a contra-indication to major surgery will also prevent the operative removal of stones, even if it is otherwise desirable, and will force the use of either medical or minor surgical measures. It is well to remember that stones, particularly if they have been present for a long time and are associated with infection, are often complicated by diseases of other organs, notably those of the circulatory apparatus, and that a sufficiently

*Read in Section on Urology, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

†Professor of Urology, Georgetown University.

thorough general examination to demonstrate operability should precede any radical treatment.

The most urgent indication for immediate operative removal of stone in the upper tract is the occurrence of either anuria or a marked oliguria. This complication is rare, but is extremely important, since, unless it can be relieved, death is inevitable. It is rapidly progressive, too, in that the longer it has lasted before the removal or circumvention of the calculous obstruction that causes it, the more apt it is to continue unrelieved and to cause death. Minor measures such as the passage of a catheter beyond the stone, the use of pelvic lavage, or forcing the stone back into the renal pelvis with a ureteral catheter or bougie, although successful at times, do not enjoy the same confidence in practice as operative removal. Calculous anuria is thus an indication for operation without necessarily more than a roentgenogram for guidance and, even if no stone shadow is shown on the film, operation may be advisable if the clinical history indicates that the anuria may be due to stone. Under such circumstances, a stone that is not radiopaque may be concerned and, at operation, whether a stone is found or not, the kidney may be treated by pyelotomy or nephrotomy, and the anuria possibly be relieved.

The location, number, size and shape of stones that may be present, the amount of functional loss and the anatomic damage that the kidney has sustained, and the presence or absence of infection are the dominant renal factors which influence the treatment to be pursued. Modern methods permit them to be determined with great accuracy and thoroughness.

Small stones producing only slight or moderate obstruction may ordinarily be treated expectantly. Stones impacted at the uretero-pelvic juncture may sometimes be pushed back into the kidney pelvis with a ureteral catheter and the accumulated urine drawn off, thus controlling for the time the complication of obstruction and possibly that of infection as well. If a small stone is thus dislocated, it may engage again in a new presentation and pass along readily. Otherwise, manipulation cannot be expected to help a great deal, and repeated instrumentation will perhaps encourage rather than prevent infection. If marked infection or evidence of considerable obstruction is already present or develops, surgical removal is advisable, lest enough damage to the kidney to require nephrectomy result.

Medium sized stones that are causing symptoms and are certainly too large to pass should be removed by appropriate operation, because little but further difficulty can be hoped from them if they are permitted to remain, and these difficulties may come on suddenly and be disturbing if not disastrous. If such a stone is silent clinically, the patient is often loth to accept operation because of the slight trouble he is experiencing and the surgeon may not urge its removal either because of the hazards and uncertainties of the operation itself or because of the possibility of recurrence, neither of which is inconsiderable. No fast rule may be laid down to cover these cases and the decision often has to be left with the patient after a fair and impartial discussion of the whole situation. Personally I feel that no great harm can come from leaving a moderate sized non-infected non-obstructive clinically silent renal stone alone for a while, provided the patient understands the situation and can be counted on for cooperation in returning for observation from time to time. If, however, infection is present or signs of obstruction are observed on urography, prompt operation should be urged.

Very large irregular stones, described as staghorn or coral, need not be operated upon unless symptoms are marked or a nephrectomy is permissible for, at operation, it is difficult to be sure that all of the fragments are removed even under x-ray control. Infection is always associated with these large stones and is usually resistant to any form of treatment, so that immediate or remote recurrence is the rule rather than the exception. If, however, pain is great, or, if an emergency arises, these patients are not to be denied surgery, for they may be freed from their stones and symptoms for a time at least.

In the presence of multiple stones, special circumstances must be noted and considered. With bilateral stones, whether to operate or not may be decided on the basis of the general indications given above and, if operation is decided upon, the method must be carefully planned so that renal tissue may be preserved as much as possible in so far as conservation is consistent with complete removal of the stones.[2] Despite reported successes,[3] only under exceptionally favorable circumstances, may both sides be operated upon at one time. It is preferable to remove the stones from the side showing the bet-

ter function and less anatomic damage first because, later, in operating on the poorer side, conditions requiring nephrectomy may be disclosed.[4] Exceptions to this practice may be made if a stone or stones are causing obstruction or if a small stone is so situated that it may move into and obstruct the pelvis or ureter during convalescence from the first operation.

With multiple stones on one side at a distance from one another, a stone in the kidney and one in the ureter on the same side, it will be possible, in many instances, to remove both stones at one sitting, making multiple incisions if necessary. If this is not practicable, it is perhaps better to remove the ureteral stone first, although, if the upper stone is the obstructing one, the reverse may be the better course.

Recurrent stones represent our greatest disappointments. Except for those presenting marked symptoms or signs, surgery is generally to be avoided, unless nephrectomy can be done and then the possibility of stone developing later in the remaining kidney may lead to considerable caution in operating. Usually, the patient will be guided by the pain that he is experiencing and will make his own decision as to a second operation. If the stones are recurrent and silent, the surgeon is hardly likely to advocate the hazards of a second operation, except for rather pressing complications.

In the light of our present knowledge, all stone patients, and particularly those with bilateral calculi, with recurrent stones and those from whom a calcium or phosphatic stone has been removed, should be examined for hyperparathyroidism[5] (high blood serum calcium, low blood serum phosphorus, high urinary calcium and excessive phosphate excretion: loss of calcium and phosphorus from bones). The evidence of hyperparathyroid disease may not be definite, and the advisability of a searching dissection of the neck and mediastinum for parathyroid adenomata in the absence of definite evidence of a distinctive tumor may be questioned. It is possible that kidney insufficiency, if associated with phosphate retention, may in some instances be a cause of hyperparathyroidism.[6]

With patients who have passed a stone or from whom one has been removed, the presence of ample vitamin A in the diet should be assured as a prophylactic measure. Even if it does not work out perfectly in every case, the effort will be rewarded by the satisfaction for those who fail to develop stones a second time. Patients on whom for one reason or another operation is not to be done should, in addition, be put on the diet and drug regulation worked out by Higgins.[1] If the stones are not caused to disintegrate and disappear by it, their growth may be retarded or inhibited altogether and the time when surgery becomes necessary indefinitely postponed.

In every patient with stone, whether it is operated upon or not, remote foci of infection, particularly in the head areas, should be sought and eradicated or treated.

In instances in which clinical evidence points to stone but no definite or suspicious shadow is noted on x-ray, the surgeon must depend on his clinical judgment as to the handling of the case. The diagnosis often has to be made from signs of obstruction noted on the urogram, and by functional studies, and sometimes it is confirmed only by exploratory operation. Oftener than not, the difficulty in this class of cases lies not so much with the physical apparatus of the x-ray laboratory or chemical composition of the stone as with those reading the films. It sometimes happens that after a sizable stone has been passed, removed or otherwise demonstrated, a reexamination of a roentgenogram taken some time before discloses a shadow identical in size and shape, if not in position, with the one later recognized in its true light, the shadow at the earlier examination having been overlooked or misinterpreted.

1801 Eye Street, Northwest

REFERENCES

1. Higgins, C. C.: Cleveland Clinic Quart., **2**:44 (April) 1935.
2. Cumming, R. E.: Jour. Urol., **32**:600 (Dec.) 1934.
3. Hryntschak: Surg., Gyn. & Obst., **58**:103 (Jan.) 1934.
4. Winsbury-White, H. P.: Brit. Jour. Urol., **7**:235 (Sept.) 1935.
5. Chute, R.: New England Jour. Med., **210**:1251 (June 14) 1934.
6. Albright, F.; Baird, D. C.; and Bloomberg, E.: Amer. Jour. Med. Sci., **187**:49 (Jan.) 1934.

DISCUSSION (*Abstract*)

Dr. I. G. Duncan, Memphis, Tenn.—When an old scout was asked if there were any good Indians, he replied that a good Indian was a dead Indian. This is the way I feel about stones. The only ones which are not dangerous are the ones that have been removed. As brought out by Dr. LeComte, it is rarely necessary or advisable to do an emergency operation for their removal. The majority of these patients have had the stones for so long that other organs have become diseased, such as heart, lungs and the other kidney. The blood nitrogen is increased, making the patient a rather poor surgical risk unless he is most carefully prepared for operation.

Some of the ways that stones may cause trouble are: (1) by destruction of kidney tissue through pressure necrosis; (2) hemorrhage; (3) obstruction of a calix; (4) plugging of the ureter at the ureteropelvic juncture; (5) prolonging the kidney infection; (6) as a focus, it may cause infection in the other kidney. These changes may come on so gradually that a kidney may be completely destroyed in the presence of only a few symptoms referable to the kidney. So we must realize that there is a possibility of much grief arising from the stone which is left in the kidney.

Stones, when too small completely to block the ureter and especially when located in a calix, may be temporized with unless a severe infection be present. Also, it is often best to leave stag horn stones alone, especially when they are bilateral. Much kidney damage will result from their removal, and they usually recur within a short time.

I heartily agree with the author as to the inadvisability of operating upon both kidneys at once. Generally speaking, it is best to operate upon the better kidney first.

There are three underlying factors in the formation of stones: (1) infection; (2) stasis; (3) a metabolic dyscrasia. If we are to prevent the reformation of stones, foci of infection must be carefully eradicated.

Stasis must be relieved by dilatation of the ureter, pelvic lavage, and so on, and in some cases a nephropexy is indicated. A delayed emptying time is most important and warrants careful study as to its cause.

After stones have been removed, diet is very important, especially where the kidney is infected with some of the urea-splitting organisms. However, I have never seen a stone in a human dissolved or reduced in size by either diet, vitamins or drugs.

A patient was seen recently with kidney colic. A ureteral catheter was passed and the kidney drained. A kidney-ureter-bladder picture showed a stone in the pelvis about the size of a pea. Under catheter drainage the patient improved very rapidly. She refused operation. She did very well for about a year, when the stone slipped down into the ureter just below the pelvis, completely blocking it. The patient had a chill and became very critically ill. Two days later, when she entered the hospital, she was running a high temperature, was delirious and very uremic. Luckily, we were able to push the stone back into the pelvis and to secure fair drainage by indwelling ureteral catheter. However, it required two weeks to get the patient in condition for operation.

Goliath is not the only person who has been killed by a pebble.

Dr. Linwood D. Keyser, Roanoke, Va.—We have come to realize that stone is not a disease entity. It is the clinical manifestation of several physicochemical mechanisms.

Two of these mechanisms have been demonstrated by research methods. First, the hyperexcretion of crystalloids in hyperexcretory lithiasis; and second, the encrustation of necrobiotic epithelium with lime salts, or encrustation lithiasis.

Clinically, hyperexcretion probably causes stones of uratic, oxalatic and cystin types, and also the phosphatic variety due to hyperparathyroidism. Probably stones associated with fractures, tumors and inflammatory disease of bone belong in this group. Hyperparathyroidism is exemplary of the type. It is associated with a shift in the site of calcium excretion from the bowel to the kidney and a consequent hyperexcretion of calcium salts which results in stone formation.

The mechanism of encrustation produces those calculi due to specific bacteria. The experimental work is scientifically correlated with clinical experience, although many features of this type of lithiasis await elucidation in further research. The process is one of calcium deposition or encrustation on effete epithelium. Lithiasis noted at times from alkalinizing drugs and that due to a possible deficiency in vitamin are probably of encrustation type.

Stones are nearly always mixed in chemical composition, this depending on the quantity of urinary crystalloids, the concentration of the urine, its hydrogen ion concentration and upon the rate of formation of the stone. Rapidly forming and recurrent stones tend to be purer than those of slow growth.

In therapy there is much confusion at present. I feel that this may be partly corrected by the effort to establish whether the calculus has been produced by the hyperexcretory or encrustation mechanism, and to determine its specific type if possible. Certainly this cannot always be done, but even with our present laboratory and clinical methods this differentiation of types is frequently possible and will become more so in the future.

In 1933 at Chicago, I brought out the fact that acidification of the urine would aid in preventing the recurrence of alkaline earth stones and presented with x-ray demonstration the first instance, I believe, of purposive dissolution of a carbonatic stone by application of this principle. I feel that soft, recently formed or rapidly recurrent calculi may at times be attacked in this manner, but results have not been consistent in my hands.

The subject of vitamin A is approached with some reservation, although I suggested its usage as early as 1930. While the vitamin may be of value, I feel that its place as a specific therapeutic agent for calculus is not yet established with scientific exactitude. My reasons are these:

Animals with experimental hyperexcretory and encrustation lithiasis of infectious type are not protected by vitamin A.

Patients with stone do not present the excessive vitamin deficiency which is necessary to form calculi in animals.

We have seen stones grow in size and have seen recurrences during intensive vitamin administration.

Chronic non-calculous infections are not appreciably affected by vitamin therapy.

The combined use of acid diet and drugs with vitamin A precludes the scientific evaluation of this vitamin as a specific for stone.

However, the salutary effect of vitamin A on epithelial structures is accepted by authorities on nutrition, and one cannot say it is without value. It should be emphasized, however, that the indiscriminate use of vitamin A and acid ash or of any single dietary therapy for each and every type of calculus is unsound and not consistent with a scientific approach to the problem. Unfortunately, the layman is being led to believe differently by the wide publicity which has been given to this regimen.

My last case of dissolution was in a man of 60 years who presented a calculus about 3 cm. in diam-

eter in his right kidney. His dietary history over many years showed an unusual intake of vitamin A, and he had for several years taken halibut liver oil periodically as a prophylaxis against colds. His urine was constantly acid (pH 5 to 4.5). For this reason I decided to try intense alkalinization of the urine. After a week fragments of urates began to pass. These were followed by the passage of a sizable particle of urate composition in the second week, after which the x-ray was negative. Dr. Strohm, of Portland, has recently written me of a similar case in his experience.

In short, the patient with lithiasis must be individualized. Determine if possible the mechanism and etiologic type of disease present. Correct urostasis and infection. Remove the stone and determine its chemical composition. Adjust the reaction of the urine to the H-ion level indicated. Correct his metabolic perversions. By application of these principles I believe that many cases of recurrence can be prevented and a few stones dissolved. Nevertheless, I am constrained to believe that we have far yet to go and that many disappointments and seemingly impossible situations will arise as we strive to learn more of this disease.

Dr. Bransford Lewis, St. Louis, Mo.—I suggest that Dr. LeComte give due attention to the succussion method of removal of small stones from the renal pelvis or calyces through cystoscopic manipulations, as described by me in several contributions of late years. This method has been used with success and satisfaction not only by Dr. Carroll and myself on numerous occasions, but also by a number of other urologists (Dr. Weems Turner, Dr. Walther, Dr. Shropshire, and others) so that there is no longer any doubt as to its efficacy when used in appropriate cases. A patient of ours who had the stone-forming habit was restored to a fair degree of health and kept going for ten years by the repeated removal by this method of small stones from the lower calyx and pelvis of his remaining left kidney. We applied the succussion method in the office under local anesthesia on one day and he was accustomed to come down the next day with a broad smile on his face, declaring: "Well, I got ten this time."

Dr. B. Weems Turner, Houston, Tex.—I shall confine my remarks to the one phase of Dr. Bransford Lewis' succussion method of removal of stones from the kidney pelvis.

In this method one should vary the technic in a way which will secure the best results. The technic that has given us the best success is to use 2 per cent procaine hydrochloride 5 c. c. in the kidney pelvis and ureter, and wait five minutes, then inject a 25 per cent solution of hippuran, filling the kidney pelvis to the point of mild pain. Plug the end of the catheter, turn the patient on the opposite side, gently manipulating the kidney region bimanually. Dependent upon the location of the stone, lower the head or the foot of the table. The heavy specific gravity of the media used is non-irritating and tends to float the stone out of its bed. You may fail, but the procedure is to be repeated many times, if necessary. We always dilate the ureter to above normal size and flush the pelvis in an effort to get rid of the infection.

I feel that Dr. Lewis' suggestion of the ballottment method of removal of stones from the kidney pelvis has been of distinct advantage to us in increasing the per cent of removal of stones.

Dr. Arthur C. Simon, Decatur, Ill.—I think it might be of interest at this time to mention a postoperative method of stone removal, new to me, which I used for the first time in a patient in whom a small stone 0.6 cm. in diameter could not be found in the kidney pelvis at open operation. A nephrotomy had been done and the rubber dam drain left in place. On the twelfth postoperative day the rubber dam drain was easily replaced with a No. 20 rubber urethral catheter and a roentgenogram was taken which showed the stone below the catheter in the lower part of the kidney pelvis. Because of the ease with which the catheter passed through the nicely granulated fistula, it did not seem illogical to try cystoscopic removal of the calculus. Accordingly a No. 24 sheath McCarthy panendoscope was easily passed into the kidney pelvis, the medial portion and some of the calyces were clearly visualized. With the aid of free irrigations the stone was finally brought into view and removed with a small Bransford Lewis ureteral stone forceps, much to our gratification and relief. No general anesthesia was used and there was no pain and no complication.

I feel that this method will prove invaluable in those cases in which, for one reason or another, small calculi, or fragments, are not completely removed at open operation.

Dr. Wm. S. Ehrich, Evansville, Ind.—May I present a case that is rather unique? The patient, a girl of 8 years, was referred for pyuria of several years' duration. The x-ray showed a shadow that was most interesting. There was a triangular shadow with projections corresponding to the calices, in fact, a perfect pyelogram.

A pyelotomy was done and the incision extended by stretching into what, fortunately, was an apparently bloodless area of the kidney tissue. The stone was delivered and was about the size of the first joint of the thumb.

The child made a perfect recovery and the function of the affected kidney is normal at the present time.

Dr. Hubert K. Turley, Memphis, Tenn.—I wish to stress the importance of clearing up the infection in the kidney after operation. This must be done if recurrence is to be prevented. These patients are in the habit of drinking large quantities of water, which gives a very dilute urine. The analysis in such cases shows very few or rare pus cells and we are lulled into a false sense of security. These patients should be told to restrict their fluids before specimens are taken of the urine and one will be surprised to find many pus cells in the centrifuged specimen.

I should like to stress the importance of removal of all particles of stone at the time of operation. This may be determined by x-ray at the time the kidney is exposed as mentioned by Dr. LeComte. In addition the location of these particles or stones may be facilitated by a simple device of silver wire fastened about the kidney to act as a marker before the x-ray exposure is made. Such a device was described by me in the SOUTHERN MEDICAL JOURNAL in November 1933.

Dr. LeComte (closing).—I did not include Dr. Lewis' method of inducing small stones to pass from the kidney because the subject matter of my paper dealt with

the indications for operative removal of stones. I have used Dr. Lewis' maneuver several times, but with only indifferent success, perhaps because I did not execute it properly, or, more than likely, because, as I realize now, I applied it in stones that were too large or that were in the calyces and not properly situated for it.

My object in bringing this subject before you was to emphasize that, despite the success that may seem to follow a policy of waiting, operation is often indicated as an elective procedure to save the kidney from severe and irreparable damage.

SOME OBSERVATIONS ON THE JAMESON RECESSION OPERATION FOR STRABISMUS*

By J. W. JERVEY, JR., M.D.
Greenville, South Carolina

My purpose in selecting this subject is primarily to emphasize the simplicity, the safety and the high percentage of satisfactory results from the correct employment of the Jameson operation by the average ophthalmologist, and not to present any alteration of a technic carefully thought out and already well tried. No modification which has been discovered in reviewing the subject appears to add to the value of or to simplify the original procedure. May I remark in passing, however, that I have not strictly adhered to the use of three scleral sutures, but have been successfully employing one only as recommended by Reese and have had no occasion to regret it, although I do not doubt as Dr. Jameson has stated that single suture operations make for a contracted or pointed attachment. This being true, no objection is to me apparent and a single suture would seem to minimize the possibility of puncture of the sclera and the chance of infection. Similarly I have not been concerned with the meticulous measurement of the exact amount of recession for the reason that the deviation in most of my cases was of such extent as to need the maximum correction, or the patients so young, or lacking in cooperation, or the deviation so variable as to make accurate determination of the amount of strabismus virtually impossible. There appears to be on the part of nature a most helpful and satisfactory adjustment of an over-correction or under-correction of slight degree. I do not doubt, however, the merits of careful computation and gradation in errors of low degree where measurements can be accurately determined.

You will not be burdened with repetition of the delicate problems concerning preoperative diagnosis, the decision to operate, and the choice of procedure. The argument is admirably set forth in the excellent writings of Duane, Jameson, White,[8] and others.

For the benefit of those of you who are not yet convinced, I have reviewed the twenty-one complete cases of internal strabismus occurring in my own practice during the past two years upon which a Jameson operation was performed. Note that the word "performed" is used and not the word "indicated," for included in unsatisfactory cases are two in whom poor results are directly attributable to errors of judgment and not to failure of the operation to do all that might be expected of it. On these twenty-one cases twenty-nine recessions were performed without infection and without complication. Impairment of rotation has not been encountered. Convergence was impaired once due to an error in judgment. In two cases tucking of the externus was combined with recession of the internus.

There are four unsatisfactory cases, although in three of them the parents have been perfectly satisfied with the results. One case with an original squint of about thirty degrees still has about a twenty degree error after a bilateral recession. A shortening operation should undoubtedly have been combined here with or used instead of recession. One case had a moderate vertical deviation which unfortunately was not taken into account when a recession was done, and the fault does not lie with the operation. The third case had a weak internus and externus and tucking was combined with recession. The cosmetic effect is good, but there is impairment of convergence and a slight overcorrection. The poor result in this case is directly attributable to an error in judgment. The recession should never have been performed. The fourth case is similar to one mentioned by White.[8] She was thought to be an ideal case for a Jameson recession. After operation, however, she has a moderate esotropia for near and a slight exotropia for distance. Apparently she has both an excess convergence and an excess divergence.

Of the twenty-one cases seventeen are successful. Cases were classed as successful where the visual axis of a virtually useless eye was brought so nearly parallel to that of the good

---

*Read in Section on Ophthalmology and Otolaryngology, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

eye as to give an excellent cosmetic result. Successful cases where vision is good in both eyes include only those which appear straight either with or without glasses, although a slight deviation may appear with screen tests. Taking all cases, 81 per cent were successful, while if we exclude the two cases where judgment was obviously at fault, and these should be excluded in a true evaluation of the technic employed, 90 per cent of cases were successful. This compares favorably with percentages in the much larger series of Jameson,[2 3] Thornwall Davis[5] and others.

I regret not having a visual record of my own cases to show you, for

"We credit most our sight; one eye doth please, our trust farre more than ten eare-witnesses."

(We are indebted to Dr. Jameson for the new film beautifully illustrating his operation.)

REFERENCES

1. Berens, Losey, and Connolly: Retroplacement for Strabismus. Amer. Jour. Ophth., **12**:720, 1929.
2. Jameson, P. Chalmers: The Surgical Entity of Muscle Recession. Arch. Ophth., **6**:329, 1931.
3. Jameson, P. Chalmers: Some Essentials and Securities which Stabilize Operation on Ocular Muscles. Arch. Ophth., **8**: 654, 1932.
4. Mott, W. C.: Muscle Recession with Tendon Stumps and Tenon's Capsule Fixation. Arch. Ophth., **8**:858, 1932.
5. Davis, W. Thornwall: The Modern Conception of Treatment of Concomitant Strabismus. Ky. Med. Jour., Aug., 1932.
6. Prangen, Avery DeH.: Surgery of Rectus Muscles of the Eye. Trans. Amer. Ophth. Soc., —:273, 1934.
7. Davis, F. A.: Modification of Jameson Recession Operation for Strabismus. Arch. Ophth., **11**:684, 1934.
8. White, J. W.: When and How We Should Operate for Convergent Strabismus. Arch. Ophth., **12**:699, 1934.
9. Wilkinson, Oscar: Surgical Treatment of Concomitant Squint. Arch. Ophth., **11**:423, 1934.

DISCUSSION (*Abstract*)

Dr. Edward H. Cary, Dallas, Tex.—Dr. Jervey can be commended for leaving to the imagination of his hearers the beautiful results which we are willing to concede. He does not bring to us numerous pictures of strabismic patients who have been made perfect through operation.

Those of us who have been operating for a third of a century have usually obtained satisfactory results from the operation the technic of which has been mastered. It is necessary, however, in any case of strabismus for the operator to examine the patient thoroughly and properly to interpret the factors involved.

Jameson has recorded the careful manner by which he finally evolved the operative technic which he has given us and the several modifications of the Jameson operation which have followed are more or less familiar to all.

Some years ago, at a meeting of the American Medical Association in St. Louis, I recall that Dr. Savage severely criticized tenotomy of the internal rectus muscle. His objection was based upon the inability of the operator to judge the effect of the tenotomy. Dr. Savage believed that in most instances convergence would be definitely impaired in case the internal rectus muscle should be cut. For this reason he advocated advancements of the external rectus of each side without tenotomizing the internal rectus. This was before recession of the internal rectus was brought forward.

The experience of Dr. Savage was entirely contrary to my own and I am quite sure to that of other operators who have utilized tenotomy in connection with advancement. In operating upon the internal rectus one should always be careful not to go beyond a simple tenotomy, and thus the fibrous capsule will not be sufficiently disturbed to produce an ill effect upon convergence nor will it bring about recession of the caruncle.

I am willing to concede that the Jameson or any other well devised recession operation is a more scientific method of handling a tenotomized muscle, and I have adopted the procedure. I am also convinced that experience in handling the different muscles of the eye, as regarding structure, tension, relaxation, position and degree of squint, can best form the judgment which will safely guide the operator and give to the patient a satisfactory and useful eye and pleasing cosmetic results.

In discussing Dr. Jervey's paper I will not go beyond his survey to mention the specific merit of applying certain measures to recti muscles which apparently are over-active or under-active as the case may be. Also, I shall not attempt to record the essential points which should always be considered before any operative procedure.

Dr. Jameson's paper, "The Surgical Entity of Muscle Recession," which appeared in the *Archives of Ophthalmology* September, 1935, is replete with observations carefully considered and convincingly presented.

The fixation of the muscle by sclera suturing is a safe procedure. The danger of the sclera puncture should not deter an operator, but when the operation is done, one should have the advantage of needles and sutures adapted to this type of surgery.

A GENERAL CONSIDERATION OF DEFECTIVE HEARING AND DEAFNESS WITH PARTICULAR REFERENCE TO ETIOLOGY*

By N. E. HARTSOOK, M.D.
Johnson City, Tennessee

The phylogenesis of the special apparatus for hearing has evolved an organ of very delicate and fragile structure, particularly the middle and internal divisions. It is endowed with weaker resistance to injury from any source than any of the other organs of special sense.

The committees[1 2] reporting to the National Research Council stated that a statistical survey of a large number of children in schools for the deaf showed that about 60 per cent were congenitally deaf and 40 per cent had acquired

*Read in Section on Ophthalmology and Otolaryngology, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

deafness. Congenital deafness is the result of developmental anomalies that may involve the conduction mechanism, but usually involve the perception apparatus. In the etiology heredity and consanguinity are paramount and consanguinity, in proportion to frequency of incidence, is more to be feared than heredity.

The administration of certain drugs to pregnant women, particularly quinine and the salicylates, and alcohol and morphine addictions, play an important role in the etiology of congenital deafness. Quinine has a particular predilection for the auditory nerve and is first in importance, with the salicylates a close second. Alcohol and morphine are etiologic factors as the result of habitual and excessive use. Taylor[3] called attention to the prenatal administration of these drugs, cited many authorities and related a number of instructive case reports that appear to be conclusive evidence of the etiologic relation of these drugs to congenital deafness.

Acquired deafness in children may come on at any age, but it is usually at an early age when the first symptoms appear. From infancy to 10 or 12 years of age is the period during which most children contract infectious diseases leading to affections of the ears.

A loss of hearing acuity in early life, if not restored to normal, may progress to advanced and permanent deafness in later life, having reached a stage at which treatment not only fails to relieve, but in some instances may do harm. Shambaugh[4] teaches that "most persons who are afflicted with deafness acquire this from a process that begins in adult life and has nothing to do with aural troubles of childhood." Shambaugh, Jr.,[5] believes that most cases of mild deafness clear up spontaneously at puberty, but that in some instances a residual hearing loss remains and this occasionally progresses to severe deafness. Sturm,[6] Rodin,[7] Coates,[8] Chamberlin,[9] Coates and Gordon[10] and other observers believe that most of the deafness of maturity has its inception in the preventable deafness of childhood, and that with very few exceptions practically all the acquired deafness of childhood is preventable, and in consequence of this most of the deafness of maturity should be prevented. Therefore, early detection of hearing losses in childhood is of the very greatest importance if restoration to normal is to be expected, or if progression to incapacitating degrees of deafness in maturity is to be prevented. With few exceptions there is no line of demarcation that distinguishes between the deafness of childhood and the deafness of maturity other than the variants of etiology.

Tympanic disease leading to acquired deafness consists of one of two processes with a probable transition stage, namely: catarrhal tubotympanitis and suppurative otitis media. Both processes are due to infection, low grade in the first and active in the second, and both may involve the labyrinthine structures. There is another toxic process due to the incidence of acute infectious diseases that may invade the labyrinth directly without the intermediary of active tympanic disease and result in profound deafness.

Catarrhal otitis media is usually insidious, and progression of the disease is irregular and slow. It is preceded by edematous swelling of the tubal mucosa and in consequence there is associated leukocytic infiltration of the mucous and submucous tissues, resulting finally in tubal obstruction and conversion of the tympanum into a closed cavity. The oxygen of the contained air is absorbed and a partial vacuum is the result. Then external air pressure is no longer counterbalanced by tympanic air and in consequence negative pressure congestion of the tympanic mucosa and retraction of the membrana tympani ensue. This stage may be attended by moderate pain, which is a danger signal that is often overlooked. Also, at this stage inflation of the middle ear usually will afford some temporary relief, but unless the cause is removed relief is of short duration and progression of the pathologic process continues unabated. I cannot too strongly emphasize the statement that it is in this early stage of the disease, and in this stage only, treatment can be relied upon with some degree of reasonable assurance to effect a cure and preserve the hearing. Effective treatment consists almost entirely in removal of the cause. Treatment directed toward relief of the aural condition proper is important, but it is a contributory measure only.

Within a variable period of time after the tympanum is vacuumized the resultant negative pressure produces serofibrinous transudate from the lymph spaces that almost fills the tympanic cavity. If the course of the disease is not changed by gross suppuration the rather slow process of organized fibrous connective tissue formation goes on to the development of adhesions. The newly-formed bands of connective tissue, the hypertrophied tympanic mucosa and recession of the membrana tympani result in almost complete obliteration of the

tympanic cavity. The ossicular chain is finally immobilized by fibrous connective tissue fixation of the incudomalleal and the incudostapedial articulations. Further advancement of the process results in stapedovestibular fixation and extension of fibrous bands over the fenestra rotunda. At this stage deafness, frequently of the paracutic type, is complete for the spoken voice. The edematous tubal mucosa may finally undergo resolution with resultant normal patency of the eustachian tube, but the tympanic disease will remain through life, and may eventually invade the labyrinth with a transudate resulting in deafness almost if not complete for sound of any kind, especially if the process involves the auditory nerve. When an acute exudative otitis media fails to undergo the process of resolution; and when the formation of new fibrous connective tissue is advanced; and when adhesions of the middle ear structures are established; and when the drum membrane, atrophied and distorted, falls in against the vestibular prominence, deafness is advanced and permanent.

The catarrhal process may be converted into a suppurative process by active infection at any time, but especially in the stage of transudation; or the tympanic disease may be primarily suppurative. A virulent strain of infecting organism quickly converts the tympanum into an abscess. The tympanic end of the eustachian tube usually is completely closed by inflammatory swelling and pus is held under pressure. Unless surgical relief is immediately forthcoming the tympanic pressure increases and in a short time ulcerative rupture of the drum results. At this stage there is great danger of mastoiditis occurring as a complication. The tendency then, usually but not always, is to become chronic with foul aural discharge and the formation of cholesteatoma. Although the ossicles are very resistant to necrosis they may be partly dissolved in the purulent process and swept away in the acute stage, but their destruction, which may never be complete, usually is accomplished by slow necrosis and the infinitesimally small particles of bone are swept away by the vile-smelling discharge of aural debris. Middle ear suppuration is dangerous, not only for the reason that it is an incapacitating disease that often damages the hearing irreparably, but also for the reason that mastoid abscess and labyrinthine and intracranial spread are imminently probable complications.

There are many pathologic conditions that may give rise to these serious aural diseases. Many otolaryngologists have believed that in children tonsils and adenoids and in young adults some nasal malformations give rise to most of the aural afflictions. Without question they do perform a conspicuous role, but that role is a minor affair when compared with some other causes. Sturm[6] believes that adenoids are particularly destructive to hearing, but he admits that "treatment of the adenoid child does not always cure or even prevent deafness." That is true, and the reason is that the presence of adenoids is only occasionally the cause of deafness, and that before the age of puberty as after that age they undergo rapid recession and quickly cease to be an etiologic factor.

Coates,[8] Fenton,[11] Tumarkin,[12] Roy[13] and other writers have called attention to the aural damage that may result from ocean bathing and the inland swimming pool. Without question much injury to hearing can occur from this cause, coming on insidiously and unnoticed until hardness of hearing attracts attention, and without the spectacular symptoms of pain and otorrhea. However, severe tympanomastoid suppuration can occur as a result of diving in infected water. There is not only the danger of initiating acute infections, but there is also the danger of aggravating an already acquired but quiescent middle ear trouble and provoking renewed activity and acceleration of hearing failure.

For many years Emerson[14 15 16] has taught that with but rare exceptions all progressive deafness is caused by one or more primary foci of infection, subject to repeated acute exacerbations and elaborating toxins that are slowly absorbed and blood-borne, that cause damage to the hearing mechanism. Gottlieb[17] holds very much the same view, and believes also that the combined influences resulting from toxemia and the endocrinopathies may be the dominant factor in the etiology of "constitutional deafness."

I am convinced that the purulent drainage from infected nasal sinuses flowing over the nasopharyngeal mucosa may give rise to as large a percentage of aural disturbances as most, if not all, of the other causes combined. The toxic flow passes over the pharyngeal orifices of the eustachian tubes and starts either catarrhal or suppurative processes in the middle ear according to the virulence of the infecting organism and the facility for entry through the eustachian tube. Cullom[18] holds this view, and believes that drainage from sinusitis may even cause enlarged adenoids and infected tonsils.

It is easily conceivable that this may be true when it is recalled that most of the chronic nasopharyngitis is due to this one cause. He refers to Compbell, Fowler, Childs and Hoople to the effect that of the rather large groups afflicted with aural diseases that came under their observation, 90 to 91 per cent had associated sinusitis. Cullom also reported on a series of more than 100 cases of acute mastoiditis coming under his observation and states that 85 per cent of them had demonstrable sinus infection. These figures are certainly significant of the very closest etiologic relationship of sinusitis to middle ear and mastoid pathology.

It is now well known that vitamin A has an important influence in maintaining a normal condition of the entire respiratory mucosa. Therefore, deficiency of intake or, on account of some unexplained idiosyncrasy, faulty metabolism of vitamin A, produces edema of the mucosa and predisposes to respiratory infections. This accounts for a slight exciting cause that otherwise would pass unnoticed giving rise to sinusitis, bronchitis and pneumonia, all of which, sinusitis in particular, in turn may involve the middle ear. In this way vitamin A deficiency has an important role in the etiology of deafness. Again we are reminded of the destructive effects of sinusitis in the etiology of aural affections.

The exanthemata and infectious diseases are known to have a prominent role in the etiology of aural affections. Chamberlin[9] estimates that

"At least 10 per cent of all cases of measles and scarlet fever, and 5 per cent of all cases of diphtheria, have some middle ear involvement."

Nevertheless, it should be borne in mind that the infectious diseases constitute a prolific source in the etiology of sinusitis of all types that may in turn be the direct cause of a large proportion of aural affections coming on some time after recovery from the acute disease. And again we are reminded of the evils of sinusitis. Also, the infectious diseases may attack the labyrinth primarily and cause labyrinthitis and destruction of the auditory nerve independent of any other pathologic process with profound deafness as the immediate result. In order of virulence, Shambaugh[4] states that "meningitis heads the list, measles comes second and scarlet fever and influenza come third." Invasion of the labyrinth by toxic processes resulting from these diseases in early life accounts for most of the acquired deaf-mutism.

In the course of tympanomastoid suppuration in both the acute and, particularly, in the chronic form there is always present the danger of spread to the labyrinthine and intracranial structures. Seydell[19] reported two cases of purulent labyrinthitis coming on in three days after the beginning of acute middle ear suppuration. Mackenzie[20] refers to Max Goerke's classification of labyrinthine pathology which I believe is the most logical, namely, the serous, fibrinous, serofibrinous, seropurulent and the purulent forms. The portals by which infection of tympanic origin usually enters the labyrinth are the two fenestrae, especially the rotunda, and erosion of the bony capsule. Labyrinthitis from the tympanum in any form is destructive to hearing, and the purulent forms are usually destructive to life if drainage occurs otherwise than through the tympanum. Campbell[21] states that labyrinthitis complicating middle ear infection is not frequent, occurring about once in 100 cases, but that cranial complications are quite frequent. McNally[22 23] points out that infection may travel through the aqueductus cochleae which leads from the floor of the scala tympani and opens into the subarachnoid space near the jugular foramen. At this point there is a connection between the cerebrospinal and the perilymphatic fluids. The irritation of serous and serofibrinous as well as purulent involvement of the vestibular and posterior divisions of the labyrinth usually produces disturbances of equilibrium and orientation that are well-nigh intolerable.

Deafness resulting from noise of the mechanically equipped industries and the noise of business traffic of modern civilization has been increasing. Noise deafness, obviously, begins in early adult life and may progress to severe deafness or total loss of hearing. Scal[24] believes that injury to the hearing of persons continuously exposed to noise is due to fatigue of the auditory nerve endings which receive the vibration and shock of discordant noises, and that continued fatigue finally brings on degeneration of the auditory nerve and progressive deafness. Smyth[25] is impressed that in addition to the destructive effects on hearing, noise is cumulative in its systemic effects and is therefore one of the greatest causes of industrial employment waste. Progression in all forms of progressive deafness is accelerated by bodily fatigue. Smyth quotes Dennis[26] as follows:

"Studies on basal metabolism of typists showed a rate increase of 19 per cent in a noisy room, with increased heart rate and pressure."

Dennis calls attention to the New York City survey of industrial noises and reported that reduction of the noise level from 45 to 35 decibels resulted in a 12 per cent increase in efficiency of office workers, and that a reduction of the noise level from 50 to 35 decibels reduced the errors of telephone operators 42 per cent. Wells[27] is convinced that noise deafness is not as common as the expressed opinion of some observers indicates, but he says:

"It can certainly occur when the individual is exposed to an intense noise at close quarters over a long period."

Authorities agree that the heavy noise of street traffic in large cities causes much damage to hearing. It is easily conceivable that subjection to average discordant noises ranging by measurement from 50,000 to 100,000 times the minimum noise of hearing can do much damage to hearing acuity. The workers at boiler-making, riveting and similar industries are subjected to high-pitched noise that by measurement is found to be five billion to ten billion times the minimum of hearing. Under such circumstances destruction of hearing is certain and often complete.

The trophic centers in otosclerosis are usually but not always closely adjacent to the internal margin of the fenestra ovalis and, therefore, the process usually but not always results in bony stapedovestibular fixation. Dickie[28] refers to the results of Lange's study of sixty-six temporal bones from forty-five sclerotic subjects, to the effect that the location of the foci was at the fenestra ovalis in twenty-two; both fenestrae in seven and the fenestra rotunda in four. It appears, therefore, that in a fair proportion of cases the fenestra ovalis is not involved and in consequence the stapedial foot-plate is not ankylosed and the deafness may be neither severe nor of the paracutic type. Paracusis willisiana does not ensue as long as the stapedius remains free to vibrate under the impact of ordinary sound impulses. It is impossible to make a definite clinical diagnosis of otosclerosis in the absence of stapedovestibular fixation, as Bezold's triad, Sturm's and other tests give no information that is definitely indicative of a sclerotic condition. Heredity and progression alone may offer suggestive but not sufficient evidence upon which to base a diagnosis.

According to Shambaugh[4] otosclerosis is responsible for more than one-third of the severe deafness of middle life, and Shambaugh, Jr.,[5] states that 70 per cent of adult deafness is due to this cause. Drury[29] believes that "7 per cent of all ear cases suffer from otosclerosis." Nash[30] reported on 1,000 cases of deafness due to various causes and stated that less than 6 per cent were definitely diagnosed as otosclerosis. This discrepancy in diagnosis may be due to lack of distinction between primary otosclerosis and secondary stapedovestibular fixation due to middle ear disease which may degenerate into a condition that simulates true otosclerosis very closely. However, it is possible for sclerosis to exist concurrently with either a chronic catarrhal or an old suppurative process, and when this occurs it is impossible to make a clinical differentiation except in cases of unilateral suppuration, and then in the non-suppurating ear only.

Heredity is generally recognized as the paramount etiologic factor. Nevertheless, in a fair proportion of cases no history of heredity can be elicited. Hereditary deafness was not handed to us in an unbroken line from Adam, but originated since his day. Then, when and how did heredity begin?

Drury[29] believes that endocrine dysfunction in early life performs a signal role in the etiology of otosclerosis, and that the sclerotic process usually begins about the age of puberty. He says that

"In a dominant percentage of cases the several endocrine glands are direct etiologic factors through their influence on normal metabolism."

Drury's view is corroborated by Rowe's[31] report on the study of a group of deafened pubescent children, in which he said:

"Injury to the central nervous system from trauma or disease forms the largest single group, with endocrine disorders a close second."

Jones[32] calls attention to recent research into endocrine dysfunction with reference to its place in the etiology of aural disorders and concludes that these disturbances, particularly thyroid dysfunction, are the result of toxemia, and that they cause disturbances of metabolism which affect the organs of special sense. He agrees with Drury that proper glandular treatment, if started before stapes fixation is established, may be administered with reasonable assurance of effecting improvement. The correlation of the view entertained by Emerson,[14 15 16] Gottlieb,[17] Jones[32] and others based on the effect of toxemia and the view entertained by Drury,[29] Rowe,[31] Jones,[32] Gottlieb[17] and others based on the effects of endocrine dysfunction certainly gives strong support to the conclusion that he-

reditary influences in the etiology of otosclerosis may be originated and passed on in families that have never before had any ancestral hereditary characteristics whatever.

Some otologists have been impressed that there may be a close etiologic relationship between either rickets or osteomalacia and otosclerosis. The fallacy of this theory was proven by Barlow's[33] animal experiments. He induced advanced general osteomalacia by feeding a diet deficient in vitamin D. At necropsy there was no loss of calcium in the bony capsule of the labyrinth, but on the contrary the bone was hard and flint-like. Apparently the function of hearing is not impaired in any way by a vitamin D deficiency.

There are many questions with reference to aural disease and consequent loss of hearing to which we are unable to give satisfactory answers in the present state of our knowledge. However, let us hope that we are approaching the time when we can feel assured of a satisfactory solution of many of the aural problems that give us much concern today.

BIBLIOGRAPHY

1. Shambaugh, G. E.; Hagens, E. W.; Holderman, J. W.; and Watkins, R. W.: Physical Causes of Deafness: Report of Committee, National Research Council. Part II: Statistical Studies of the Children in the Public Schools for the Deaf. Arch. Otolaryng., **7**:424-513, 1928.
2. Shambaugh, G. E.; Hayden, D. B.; Hagens, E. W.; and Watkins, R. W.: Statistical Studies of the Children in Public Schools for the Deaf. Arch. Otolaryng., **12**:190 (Aug.) 1930.
3. Taylor, H. M.: Further Observations on Prenatal Medication as a Possible Etiologic Factor of Deafness in the New Born. Sou. Med. Jour., **28**:125-130 (Feb.) 1935.
4. Shambaugh, G. E.: The Problems of Deafness. Arch. Otolaryng., **14**:36-47, 1931.
5. Shambaugh, Jr., G. E.: The Prevention and Treatment of Deafness. Ann. Otol., Rhinol. & Laryng., **43**:513-524 (June) 1934.
6. Sturm, F. P.: Adenoid Deafness. Ann. Otol., Rhinol. & Laryng., **37**:579-591 (June) 1928.
7. Rodin, F. H.: Survey of the Hearing of the School Children of San Francisco. Arch. Otolaryng., **11**:463-474, 1930.
8. Coates, G. M.: The Prevention of Deafness. Ann. Otol., Rhinol. & Laryng., **40**:651-660 (Sept.) 1931.
9. Chamberlin, W. B.: Preventable Diseases of Childhood. Laryngoscope, **36**:827-833, 1927.
10. Coates, G. M.; and Gordon, W.: The Otologic Management of Progressive Deafness. Trans. Amer. Acad. Ophthal. & Otolaryng., 1933.
11. Fenton, R. A.: Otorhinologic Pathology of Swimming. Ann. Otol., Rhinol. & Laryng., **37**:275-289 (March) 1928.
12. Tumarkin, A.: The Bathing Pool and Deafness. Brit. Med. Jour., **11**:357 (Aug. 25) 1934.
13. Roy, Dunbar: Some Observations of Auditory Canal Infections. Ann. Otol., Rhinol. & Laryng., **36**:177-182 (March) 1927.
14. Emerson, F. P.: Has Science Thrown any New Light on Our Understanding of Chronic Progressive Deafness? Ann. Otol., Rhinol. & Laryng., **40**:9-12 (March) 1931.
15. Emerson, F. P.: Perception Deafness. Trans. Amer. Otol. Soc., 1921.
16. Emerson, F. P.: The Etiology and Treatment of Nerve Deafness. Ann. Otol., Rhinol. & Laryng., **35**:1098-1109 (Dec.) 1926.
17. Gottlieb, Mark J.: Constitutional Deafness. Ann. Otol., Rhinol. & Laryng., **43**:541-552 (Juue) 1934.
18. Cullom, M. M.: The Association of Sinus Disease and Middle Ear Infection. J.A.M.A., **103**:1695-1699 (Dec. 1) 1934.
19. Seydell, E. M.: Tympanogenous Labyrinthitis Resulting from an Acute Otitis Media in Its Early Stages: Report of Two Cases. Ann. Otol., Rhinol. & Laryng., **39**:151-158 (March) 1930.
20. Mackenzie, G. W.: Suppurative Labyrinthitis with Report of Cases. Ann. Otol., Rhinol. & Laryng., **36**:1019-1059 (Dec.) 1927.
21. Campbell, E. H.: Complications of Otitis Media and Mastoditis. Ann. Otol., Rhinol. & Laryng., **38**:209-241 (March) 1929.
22. McNally, W. J.: Five Lectures on the Physiology of the Ear. Ann. Otol., Rhinol. & Laryng., **38**:1162-1196 (Dec.) 1929.
23. McNally, W. J.: Five Lectures on the Physiology of the Ear (Concluded). Ann. Otol., Rhinol. & Laryng., **39**:248-290 (March) 1930.
24. Seal, J. C.: Noise Deafness in Industry and Environment (Occupational Deafness). N. Y. State Jour. Med., **33**: 1251-1254, 1933.
25. Smyth, H. F.: Noise in Industry: Its Effect on the Hearing and on General Health (a Review of the Literature). Ann. Otol., Rhinol. & Laryng., **41**:1108-1116 (Dec.) 1932.
26. Dennis, E. B.: Noise: Its Measurement and Control. N. Y. State Jour. Med., May 15, 1930 (quoted by Smyth).
27. Wells, W. A.: The Noises of Civilization and Their Evil Effects. Ann. Otol., Rhinol. & Laryng., **40**:143-156 (March) 1931.
28. Dickie, J. K. M.: Progressive Deafness: Otosclerosis and Diseases of the Labyrinth. Arch. Otolaryng., **14**:86-97, 1931.
29. Drury, D. W.: Otosclerosis. Ann. Otol., Rhinol. & Laryng., **35**:651-679 (Sept.) 1926.
30. Nash, C. S.: A Study in Otosclerosis. Ann. Otol., Rhinol. & Laryng., **39**:769-778 (Sept.) 1930.
31. Rowe, A. W.: Vital Function Studies. XII: Analysis of a Group of Children with Impaired Hearing. N. Eng. Jour. Med., **211**:954-963 (Nov. 22) 1934.
32. Jones, M. H.: discussion to Rowe (31).
33. Barlow, R. A.: Does Vitamin-Deficient Diet Cause Deafness? Results of Animal Experimentation. Laryngoscope (Sept.) 1927.

410 Hamilton Bank Building

DISCUSSION (*Abstract*)

Dr. G. H. B. Terry, Oteen, N. C.—This excellent paper has impressed me forcibly in two ways: first, as to its completeness. In the present state of our knowledge I think that but little more could be said as to the etiology of deafness.

In the second place, I have been impressed by the minor role to be played by the otologist in bringing about a decrease in the number of cases of deafness. When the otologist sees these cases the damage usually has been done. We need the help of the general practitioner, the obstetrician, the dietitian, the city authorities, the heads of industry and, most of all, Dorothy Dix. I fear, however, that it will be a long time before as much good sense will be used in mating humans as is used in mating domestic animals, and until then we shall have many cases of hereditary deafness.

I am glad that the speaker did not mention tuberculosis as a frequent cause of deafness. Over ten years' experience with an average number of 700 cases of tuberculosis under observation has led me to believe that tuberculosis of the ear is not of frequent occurrence.

Over fifty years ago Caillé, in a contribution to the New York Academy of Medicine, advocated in the treatment of diphtheria, scarlatina, measles, pertussis and before and after operations on the nose and throat the instillation into each nostril night and morning of a teaspoonful of salt water, 1 per cent, as the children lie on their backs with nose tilted up and mouth open. He states that: "The liquid does not wash through at once; some of it remains in the various recesses of the nasal cavity, and is eventually sneezed out or swallowed. In this way putrescible matter and bacteria are washed away. * * * The nasopharyngeal toilet not

only does not provide middle ear and sinus complications, but, according to the experience of the writer, apparently prevents them."

This treatment required no apparatus besides a teaspoon, no medicament except salt, and no trained attendant to administer it.

It has been many years since I have treated children, but while in general practice for many years I followed the above treatment advocated by Caillé in 1884. I believe that it is still good treatment and am reminded of the saying of Bartholow: "All that is true is not new and all that is new is not true."

Dr. Hartsook (closing).—The magnitude of deafness with its widespread and inhibiting influence on the educational, industrial, economic, eugenic and social progress of man is a problem the gravity of which is not yet generally understood. Many children do not realize that they have defective hearing, and many adults try to conceal it. Therefore, it is impossible to realize fully the whole extent of the realm of silence into which incredibly vast numbers of individuals of all ages are relegated in varying degrees of isolation.

I do not have at hand the 1930 census report on deaf-mutism, but in 1920 the United States Census Bureau reported that there were 45,000 deaf-mutes, including both congenital deafness and the deafness that was acquired before the eighth year of age. Not many children who lose their hearing after the eighth year of age wholly lose the power of articulate speech they had previously acquired. Therefore, while they are deaf, they cannot be properly classed as mutes.

Unfortunately there are no very reliable statistics that reveal the vast number of children past eight years old, and the vast number of adults of all ages who are afflicted with advanced deafness; or the much greater number of individuals of all ages who are afflicted with moderate degrees of hearing failure. It has been reported by various observers that the examinations of school children indicate that approximately 10 per cent of them are afflicted with some hearing defect, and that it is estimated that there are more than 10,000,000 people of all ages in the United States who are suffering from varying degrees of defective hearing and total deafness. The reported estimate of approximately 3,000,000 children in the United States who have definitely measurable defects of hearing should attract an active interest among laymen as well as physicians. Assuming this number to be a correct estimate, the report of the United States Census Bureau indicates that 1.5 per cent of these children are deafened to the extent of requiring the necessary benefit of training in schools for the deaf. Then, it is impossible to approximate with any degree of accuracy the extent to which defective hearing affects the adult population. There were 2,750,000 men examined in the draft for service during the World War and 39,000 were found to have some aural defects, and most of these were not accepted for service because of their disability.

There are other phases of the problem of auditory functional disturbances that are of much interest and importance, though not of frequent occurrence. Among these may be mentioned vasomotor disturbances of the labyrinth, including the syndromes of Meniere and Lermoyez, hearing defects due to hepatic and pancreatic dysfunction and misalignment of the temporomandibular joint due to malapproximation of the mandibles, and the distressing symptom tinnitus aurium.

THREE YEARS' AFFILIATION OF A COMMUNITY CHEST MENTAL HYGIENE CLINIC WITH THE DEPARTMENT OF PSYCHIATRY IN A MEDICAL SCHOOL*

By SPAFFORD ACKERLY, M.D.†
Louisville, Kentucky

I have been asked to give this paper because of the success we feel we have had in coordinating the mental hygiene and psychiatric work in the City of Louisville.

For ten years the Mental Hygiene Clinic of the Louisville Community Chest, or the Psychological Clinic, as it was originally called, functioned separately from the Department of Psychiatry at the Medical School and City Hospital. In 1932, they were brought together. Why this was done, how it was done, and the advantages accruing will be discussed in this paper.

Before taking up these three major points, it might be well to orient ourselves with a brief historical background. Mental hygiene clinics, or child guidance clinics, were little heard of before the War. The subject of mental disease in general and its prevention came to the foreground during and after the War, as did many other important medical issues. When millions of men were under arms, the number who were found mentally incompetent was staggering. A wave of interest in this field spread over the country and the National Committee for Mental Hygiene went out to raise funds. Several large endowments, particularly through the Commonwealth Fund of New York, were created to be used for the prevention of nervous and mental diseases. A number of child guidance clinics were subsequently established throughout the country to study and treat maladjusted children.

The Louisville Psychological Clinic was established in 1919 as an advisory body to the public school system. In 1921 it was incorporated as a community service or chest agency, the personnel consisting of a director. In 1922 a psychologist was added to the Clinic; in 1924 a psychiatric social worker; in 1925 a second social worker was employed. The personnel of

*Read in Section on Neurology and Psychiatry, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

†Associate Professor of Psychiatry, University of Louisville School of Medicine, and Medical Director, Louisville Mental Hygiene Clinic.

the Clinic was then complete. The intake of cases (adults 40 per cent and children 60 per cent) was about 300 per year. The children's problems for the most part were personality, behavior, and habit difficulties as well as problems in educational guidance. The clinic was financed entirely by the Community Chest. During the next five years the work of the Clinic grew with the help of its board of prominent and interested citizens and its budget from the Community Chest was increased to a peak of $17,656.00. The clinic was situated in the same building with other Chest agencies.

After the crash, the Community Chest wisely maintained the clinic and kept it in the running. But as bread-and-butter relief became more pressing, ways and means of securing financial help for the clinic brought up the question of affiliation with the University of Louisville. The question was, could the University help support the clinic and thus conserve the gains which had been made in this field during the past decade?

It was in 1930 that the first move was made. A member of the Board of Trustees of the University of Louisville, a man fully acquainted with the affairs of the Community Chest, presented the matter to the clinic Board of Directors. Everyone seemed to favor it. One question was raised at that meeting as to whether the clinic's emphasis on prevention would be sacrificed to the heavy demands for treatment that existed at the City Hospital and Children's Free Hospital. A committee was appointed to go into the matter with the president of the University and the dean of the Medical School. The following agreement of five articles was drawn up:

(1) The University shall recommend to the Board of Directors of the Louisville Society for Mental Hygiene of Community Chest for appointment the personnel of the clinic.

(2) The personnel shall be available not only for the clinic progress, but also for clinical service, research, instruction and education of the students of the Medical School of the University of Louisville along the lines of psychiatry in its broadest sense.

(3) The budget for this department derived from the Community Chest or any source shall be expended in accordance with the policy in effect in the School of Medicine, University of Louisville.

(4) There shall be a standing committee of four for the purpose of promoting harmonious and efficient conduct of the clinic. This committee is to be composed of two members selected by the boards of each institution. This committee shall report to their respective boards all necessary recommendations.

(5) The Community Chest has supported the Psychological Clinic of the Louisville Society for Mental Hygiene for a number of years and will continue to support as it can, but feels that it should not be a part of its program indefinitely. The University desires to develop its department of psychiatry in its broadest sense, but is not able to assume its support at the present time. All parties believe the present personnel cannot be reduced without impairment to the necessary service now being rendered by the Society, but that this should be supported out of public funds rather than from private subscriptions, and the parties agree to endeavor to secure such public support from the city or otherwise if and as the Community Chest may feel constrained to withdraw its support.

The Mental Hygiene Clinic was given quarters in a house owned by and adjacent to the Children's Free Hospital, across the street from the City Hospital.

The next step was to find a new director. His was to be a three-cornered job: (1) director of the Mental Hygiene Clinic for children and adults with emphasis largely on prevention. This would necessitate training in the field of child guidance. (2) Director of the Psychopathic Wards of the City Hospital. This required training and practice in formal psychiatry. (3) Associate Professor of Psychiatry in the School of Medicine to help with the teaching of medical students and conduct some research. The services of the writer of this paper were obtained in July, 1932. Fortunately, the director had some experience in these various fields. Otherwise, he would not have been able to carry the responsibility for these three activities. Experience teaches short cuts and ways and means of killing two birds with one stone.

Now, let us turn to the advantages accruing from this merger. Certainly the Medical School at that time could not have paid a full-time psychiatrist. It realized the need for this, but 1932 was no time to do it. However, the need for more psychiatry in medical schools was being brought home forcibly by investigations of the National Committee for Mental Hygiene under the direction of Dr. Ebaugh. This Committee's standards meant more instruction and only after three years have we been able to meet these more stringent requirements. This was only possible because the National Committee for Mental Hygiene was sufficiently interested in this combination set-up to finance a fellow in psychiatry beginning this fall. The addition of his services will enable the director to give a course in psychobiology to the sophomores, thus meeting all requirements. I am sure that the National Committee would not have given us this fellow in psychiatry had they not been convinced of the advantages obtain-

able here as a training center. A community chest psychological clinic alone would not have attracted this attention, nor would a department of psychiatry without a well-established mental hygiene clinic for child and adult guidance brought this about, but the combination did. Functioning alone, the old psychological clinic would not have had all the advantages of a medical center. To be sure, they could refer cases to the hospital, but not as we do at present. The clinic now is an established part of the hospital set-up. We refer patients directly to the hospital wards. We send patients to the drug room and to the various clinics for diagnosis and treatment. We have access to all the laboratory facilities, including x-ray, and all the hospital records are available to the staff.

Before this merger, the psychopathic wards functioned merely as a place for diagnosis. Now patients are referred from the wards to the clinic for follow-up treatment. This holds true for other wards of the hospital as well: pediatrics, medicine, surgery, obstetrics. In short, all the psychiatric work of the city is concentrated in this department. The health department of the University refers students showing personality or educational problems; high schools and grade schools use the clinic. In no way has the emphasis on prevention been weakened by bringing these organizations together.

There were, however, two weak spots in this arrangement. There was no year around resident on the psychopathic service (40 beds) and no hospital social worker for that service. The latter has been taken care of and the former one we hope will be met this coming year.

While it was a mistake to start a new director in without a full-time resident throughout the year for the psychopathic wards, it did work out to the advantage of the interns. It put the responsibility squarely onto them and they assumed it very well. The assistant residents in medicine rotated through psychiatry, spending six months as resident on the psychopathic wards; one senior intern on medicine rotated through psychiatry for four months; two junior interns rotated for six weeks. They learned more psychiatry because they had the entire responsibility. However, when they changed it was not so good for the department or the patients. It takes some time for new interns to learn the ropes, so this coming year we hope to make a year's residency in psychiatry.

Similarly, the disadvantages of not having a social worker to begin with made us use the medical students for this purpose.* Each student is held responsible for a home visit to each patient assigned in order to get the history and to size up the home environment. This routine procedure has worked out surprisingly well. The student takes more interest in his patient because he knows his background and in this way learns something of the social side of medicine. There have been no complaints from relatives. In fact, they seem very pleased that the City Hospital takes an interest in the patients to the extent of sending a doctor to the home to talk matters over with them. This year, however, we have put on two student social workers to follow up the progress of patients after discharge so that the staff can carry on treatment more intelligently. These students are assigned to the psychopathic wards for their nine months' field training and are being supervised by the trained psychiatric social workers at the clinic. These students in psychiatric social work are Louisville girls who have had some experience with social work in Louisville before taking this special course in a college for social service. Before the Community Chest and the Medical School got together, schools for social work would not send their students here for training. Now these schools consider our training facilities adequate. Our policy is to train girls from Louisville and the South. In this way we feel we are making a real contribution to the general field of social welfare. Such a set-up as this can be used to train workers from other agencies who wish to send selected workers to us for several months. We did this the first year and the two workers who came to us from the family service organization were advanced rapidly when they returned to their own organization and are now supervisors. The Municipal Bureau of Social Service, operated from city and Federal funds, is sufficiently interested in our work to detail a paid worker with some training in psychiatric social work to our department at the City Hospital. She will help to carry out treatment recommendations for the nervous and mental patients on relief.

We also started a training course for graduate nurses in psychiatry with a certificate at the end of four months' regular nursing duty on the psychopathic wards. The nurses graduated have gone out into state hospitals and private nursing, where nurses trained in this field are much needed. In return for their training, they

*Ackerly, S. S.: Two Years' Experiment in Psychiatric Teaching. Jour. Assn. Amer. Med. Coll., —:— (Sept.), 1934.

gave us adequate nursing care with no additional increase in our budget. This course was arranged through the State Board of Nurse Examiners. An authority in the field of public health was very much interested in our idea of placing public health nurses on the wards of the psychopathic department and in the Mental Hygiene Clinic for several months. This could be worked out as a routine procedure for field nurses. The public health nurse should be able to recognize the beginnings of nervous and mental disorders in both children and adults whom she sees in the homes.

The clinic also has had the part-time services of the resident in pediatrics at the City Hospital, which enables the young pediatricians to gain some knowledge of the psychological problems of childhood. In return for this training, they give to the public helpful advice in pediatrics. The clinic has lent its support to pediatricians who have established a Habit Clinic at one of the hospitals.

It might be wise to bring up the question of the director's doing private work. Being a physician, he must respond to calls of other physicians, whether he is a full-time faculty member or not, and I firmly believe it should be so for several reasons. No psychiatrist is prepared to teach unless he knows how to diagnose and treat the better class psychiatric patient. Their problems are often times more subtle and more complex because they are more complex personalities than the average charity patient who comes to a clinic or to a teaching hospital. Both the professional and lay members of the board of directors of the Mental Hygiene Clinic are in accord with this policy. People of means ought to have an opportunity of procuring psychological services as well as the under-privileged. Such a clinic may be the only place available to have intelligence or vocational guidance tests done on their children and the results interpreted by a psychiatrist along with physical and neurological examinations. They are expected to pay regular fees for such services. However, the policy of our clinic is to have all private patients referred by their physicians. Fees go to the University, but are turned back to the Department of Psychiatry to be used for research; the library; special drug therapy; medical equipment, and so on.

The success or failure of such an undertaking will rest largely upon the director and the kind of backing that is given him. But it takes time. The mental health of the community is just as precious as the physical health, but it has been sadly neglected. Mental hygiene and psychiatry are highly specialized branches of medicine and should always function in a medical atmosphere, but it should also reach out into all phases of welfare and educational work in the community. It should be supported by the community as a whole, but like many other progressive steps in human welfare, it has usually been the private agencies such as the community chest with no political or other axes to grind that have led the way to higher standards of public service. Pediatricians tell me it was not so long ago that dietitians paid by the community chest were the only ones who knew anything about infant feeding. They led the way, but now this has been taken over by the doctors. So it has been in the field of mental hygiene or the prevention of mental disease, and it is only recently that the medical profession has taken it over. Medical schools should waste no time in planning adequately for their departments of psychiatry and mental hygiene. In so doing they should cultivate the friendship and enlist active moral and financial cooperation of the community welfare organizations that for years have led the way toward better human relationships and better social conditions in general.

I wish gratefully to acknowledge the help and encouragement that have been given me these three and a half years by the Board of Directors of the Mental Hygiene Clinic, the Executive Committee of the Community Chest, and the Faculty of the School of Medicine.

DISCUSSION (*Abstract*)

Dr. W. E. Gardner, Louisville, Ky.—Those of us who have been on the ground and have had some part in supporting Dr. Ackerly in the development of this close relationship between a community chest agency and the Department of Psychiatry of the University of Louisville are still enthusiastic over the project and are quite confident of its ultimate success. Three years of operation under the plan, in spite of limited personnel and inadequate financial support, except that furnished the Mental Hygiene Clinic by the Community Chest, has greatly increased the scope of our facilities for teaching undergraduate medical students, as well as giving a broader opportunity for community education.

In my non-salaried part-time capacity as Clinical Professor of Psychiatry and nominal head of the department, of which Dr. Ackerly is now the most important member, I have, for many years, realized the need of expanding the scope of our teaching facilities. It has been a long and tedious grind, especially in a municipal university, to enlist a sympathetic and substantial interest in the further development of such a department. We were confronted with the fact that

there existed a general impression that, to have a real department of psychiatry in any medical school, it was necessary that it be affiliated with a well equipped psychopathic hospital of at least one hundred beds for intensive study of various forms of mental disorders in their incipiency; and usually state supported. This assumption has, in fact, had ample justification, for we are all obliged to concede that the medical schools which have, up to this time, developed outstanding departments of psychiatry have been affiliated with such psychopathic hospitals, usually of somewhat larger capacity than has been indicated, and either privately endowed or supported by the state. There are, perhaps, not more than half a dozen such departments of psychiatry in the medical schools of this country which have attracted nation-wide attention, and one of the most noteworthy of these is that at Denver, of which Dr. Ebaugh is the head. Dr. Ebaugh has made his department so big, and his hospital has made him so big, that the National Committee for Mental Hygiene drafted him to make a survey of the departments of psychiatry in various medical schools and recommend minimum standards for teaching of psychiatry in all Class A schools. It will be our privilege, in a short time, to hear Dr. Ebaugh, who is scheduled to give us a paper on a subject which I am sure will be of immense interest to all of us.

The fact that a department of psychiatry in any medical school has attracted no more than the local interest of the community in which it is situated does not indicate, by any means, that it may not be doing meritorious work of excellent character. In most instances it is probably doing its utmost with the facilities at its disposal. With one or more well trained men in any such department, and a dean of the school who wants to build up the department, some way can usually be provided for further development. In our case, through the interest of Dean Moore and others, the Community Chest came to our rescue and helped to bridge the gap until such time as the University itself might assume full financial responsibility for the support of the department. [The University of Louisville is owned by the City of Louisville and is supported, with the exception of small tuition fees of its students, by taxation of the citizens and others who own property, both real and personal, within the city limits (intangibles not included); and, like most universities of this sort, never has as much money as it needs to support its various schools. However, it has within recent years begun to attract the attention and interest of the community at large, and we are looking forward to bigger and better things for the University at a not too distant date, we hope; especially, by the time of the celebration of its one hundredth anniversary in 1937, its first school being that of medicine, which was established in 1837. In the meantime, Dr. Ackerly and I, and others associated with us, shall endeavor to keep the Department of Psychiatry of the School of Medicine in a healthy state.] If we cannot have a teaching psychopathic hospital like those at Denver, Iowa City, Ann Arbor, Boston, New York or Baltimore, we shall make the most of the psychopathic and other wards of the Louisville City Hospital, the Children's Free Hospital and the facilities of the Mental Hygiene Clinic. In all of these, we are now having the students of psychiatry become familiar, by case histories, personality studies, home visits and otherwise, as indicated by Dr. Ackerly, not only with the outspoken psychotic states which are more easily recognized, but, especially in the fourth year, with the less tangible but none the less interesting and instructive psychoneurotic reactions of the large group of individuals who go from one physician to another, and who are, too often, either neglected or advised to have a surgical operation which is not definitely indicated. Those graduates who are interested in the treatment of children are usually first to come in contact with the problem child. Dr. Smith will tell you to what extent the Department of Psychiatry has been of value to the Department of Pediatrics.

On or about the first of December we shall have another valuable addition to our department in the person of a well educated young physician, who has had excellent training in psychiatry, and who will come to us on a fellowship from the Commonwealth Fund for further clinical experience in mental hygiene. This will not only lighten the case load of Dr. Ackerly to some extent, but will give him more time, particularly, to begin a course of instruction in psychobiology to the second year class, which, undoubtedly, will be a valuable addition to our curriculum. It will also, no doubt, command the respect of Dr. Ebaugh, who has insisted that some instruction of this sort be given, if possible, to medical students in their preclinical years, and thus prepare the student for an approach to psychiatry as something not entirely foreign to what was being taught him in anatomy, physiology, chemistry and bacteriology.

In my chairman's address to this Section of the Southern Medical Association seven years ago, in a paper entitled "A Decade of Transition in American Psychiatry," I called attention to the then somewhat unsettled methods of teaching psychiatry in our American medical schools, and made a plea for at least some attempt at unification of purpose in our teaching methods. Various methods of approach were being advocated, all of which had much merit, but it was apparent that there was a tendency to minimize the importance of certain fundamental principles of long standing which had been stressed by the masters of a previous generation. The psychoanalytic school of psychiatrists had taught us much of value regarding many mental mechanisms which had not been well understood before the promulgation of the Freudian psychology, but it was obviously impracticable, in teaching undergraduate medical students, to stress this method of approach to the exclusion of all others. We have been glad to note recently, however, a more wholesome recognition, on the part of the younger psychiatrists, that much of our present day psychological approach to the study of mental maladjustments, both major and minor, is based upon some very old but, nevertheless, well established biological principles.

Without disposition to criticize any method employed, it would appear desirable that every student of psychiatry be given at least minimum instruction regarding the various methods of approach to this important branch of medicine, of which it is becoming more and more an integral part, and its relation to surgery and the various specialties. A graduate physician who has had some hospital experience, and has become well grounded in fundamental principles which are known to be reliable, may with some degree of safety select the type of further training in psychiatry which appears to be most adapted to his special interests and inclinations. This has been, and will con-

tinue to be, the attitude of the Department of Psychiatry of the University of Louisville School of Medicine.

Dr. Harry Andrews, Louisville, Ky.—The cooperation between the Department of Psychiatry and the Department of Pediatrics described by Dr. Ackerly has been quite helpful to us in the treatment of our patients. The field of pediatrics presents many problems other than organic disease of the individual. Their cause is much more difficult to find than the cause of organic disease. Sometimes it is mild and sometimes quite grave. If the milder conditions are allowed to continue they become malignant and are much more difficult to eradicate.

If we hope to decrease psychiatric conditions in the adult we must try to arrest them at the beginning; certainly before they become grave. To do this we must start with them as they begin in the child and even in infancy, as a number of functional disturbances may be traced back to this age. Not until we are able to correct problems that present themselves at this time and also to practice preventive psychiatry are we going to reduce the functional disorders that are prevalent in later life. The penal institutions and homes for delinquents are crowded with such individuals. They will continue to be filled until we begin to take definite steps to prevent it.

These disorders were not recognized by those of us who care for children until recent years; or if we recognized them we did very little about them. As we learn more, we recognize them more readily and are able to correct them earlier in life. The physician who cares for the welfare of children should keep in his or her subconscious mind at all times the fact that a child's complaint or illness may be influenced by its environment.

The Department of Pediatrics of the University of Louisville, through the two hospitals that care for children and the out-patient clinic, encounters a great number of children suffering from functional diseases. This work was formerly left entirely to pediatricians and the success of the treatment depended upon the interest of the pediatrician in this field until Dr. Ackerly instituted the present plan of cooperation between the two departments.

Now any child whom we want studied by the psychiatrist is referred to the resident in the Department of Psychiatry. A junior and senior student are assigned to the case. They visit the home, make a social investigation and secure all the necessary data for making a study of the child. The child is then seen by a psychologist connected with the Mental Hygiene Clinic and the psychiatrist of the Department. A conference is then held in which members of both departments are present and the diagnosis is established and the treatment instituted for that particular case.

By this association we are able to teach young pediatricians whom we are training to appreciate the importance of this side of pediatrics. We pediatricians are able to become more familiar with the psychiatric side of our patients and the psychiatrist is helped from a pediatrician's point of view.

It has been of tremendous benefit to us to participate in the study of children with the Department of Psychiatry and we hope that the cooperation continues for a long time.

Dr. Ackerly (closing).—Concerning the question of how to bring mental hygiene to the rural districts, I have only this to offer: the public health nurses receive training in the recognition of the early signs of nervous and mental disorders so that they can bring to the attention of physicians these conditions in the rural districts. There is no reason why these public health nurses could not receive a course of training of three or four months' duration at some mental hygiene clinic.

The question of whether to select certain medical students to make home investigations on psychiatric patients or to take them routinely, is one that gave Dr. Gardner and me a few sleepless nights in the beginning. However, we began by routinely sending junior medical students into the homes of patients assigned to them on the psychopathic wards. We expected some backfire, but surprisingly enough we received nothing but good reports from relatives. The students were cautioned in the beginning against saying anything to antagonize relatives and were told to try to pour as much oil on the troubled waters as possible. At the same time they tried to induce the relatives to talk about the patients so as to get as good a history as possible. The students take this work very seriously and often make two and three visits to the same home.

Senior medical students are assigned to out-patient cases with milder forms of nervous disorders. This is more difficult, but having had six weeks' experience in this in their junior year, they are better able to carry it out. It gives them an understanding of the social side of medicine as nothing else does. They see distressing home situations, undesirable family interrelationships and they have a better understanding of the patient's difficulties when they come to present the case before the staff.

If I may be permitted to stress one point in the discussion, I should especially stress ways and means of establishing mental hygiene clinics. Experience has taught me not to go to the city for help in financing a mental hygiene clinic where the emphasis is on prevention. The city has all it can do to finance treatment for frankly sick individuals. Likewise, I find it as little use to go to a board of education. Its funds are so limited that it is loth to branch out into any sort of treatment program, even though it is eager to have its problem children studied at a mental hygiene clinic.

Mental hygiene is a forward-looking movement with many subtle implications for the welfare of human beings and it takes the most educated and intelligent citizens in the community to appreciate fully its aims and purposes. Therefore, these citizens are the ones to whom to go for help in establishing such an organization. These citizens sit on the boards of the community chest agencies. They have vision beyond "bread and butter" relief. They see how important character-building and mental health agencies are. It is they who can and do vote community chest moneys for mental hygiene clinics in many cities throughout the country.

Once such a clinic is established, other agencies are quick to see its value, and children and adults are referred as a matter of course. A mental hygiene clinic in a community has far-reaching effects in an educa-

tional way as well as in the number of patients it studies and treats. Knowledge of how to approach the maladjusted personality filters through to all of the social agencies and better case work is done because of it. Whether or not there is a medical school with which to affiliate, a mental hygiene clinic ought not to interfere with its development and service. But wherever there is a medical school or teaching institution, a mental hygiene clinic should become a part of it.

PUBLIC HEALTH SIGNIFICANCE OF OUR NEWER KNOWLEDGE OF YELLOW FEVER*

By BOLIVAR J. LLOYD, M.D.†
Washington, D. C.

In appearing before you today I am assuming that perhaps some of you at least have been too busy to keep up with what is new in yellow fever. If I am wrong I beg your indulgence for a few minutes in order that I may emphasize the importance of some of our newer knowledge of this disease. For the sake of brevity I shall not review the literature or name those to whom we are deeply indebted for this newer knowledge. In the collected papers of the Rockefeller Foundation and of the Rockefeller Institute for Medical Research may be found a complete bibliography not only of the achievements of their own research workers, but of those of the rest of the world.

There was a time when those who were charged with the duty of protecting the public health paid little attention to the effect that restrictive measures might have on international or interstate commerce. Also, if quarantine restrictions interfered with one's going to some place or with his returning home after having gone, well, it was just too bad. Today, health officers realize that while transportation of persons and things must be safeguarded, it may not be stopped with the impunity that was once commonplace.

I doubt that many here today realize the full significance of the fact that yellow fever is present and endemic over wide areas of tropical South America and of tropical Africa, and that it will probably remain so for perhaps centuries to come. I doubt also that we fully realize the fact that with the rapid increase of air transportation which has already taken place, this disease is potentially as dangerous to Mexico, to Central America, and to our Southern states as it ever was. It is not too much to say that from about May to November yellow fever is at our very doors, and we have many doors. It is at the doors of our southern neighbors the year round. A few years ago it was believed that yellow fever would soon be as extinct as the dodo or the diplodocus; just something to be remembered for a few generations as a sort of solemn nightmare. Today it seems within the bounds of possibility that the virus of yellow fever may be able to maintain its existence on the earth for a much longer time than man himself. Perhaps this statement requires elucidation.

When it was first proven that yellow fever is transmitted by *Stegomyia fasciatus*, now called *Aedes aegypti*, it was believed that this mosquito was the only vector of the disease. We now know that there are more than a dozen mosquitoes that transmit the virus under laboratory conditions, some of them quite readily. We know also that yellow fever is endemic in areas where *Aedes aegypti* do not exist and we do not yet know what the vector in those areas is.

Early failures to transmit yellow fever to many laboratory animals, including certain species of monkeys, led to the belief that man was the only animal host. The discovery that *Macacus rhesus* and other monkeys, and also that other animals are susceptible to yellow fever, or can be made so, threw doubt on this assumption. The fact, recently discovered, that yellow fever virus is able to maintain its existence in the sparsely settled jungles of Brazil in places where *Aedes aegypti* do not exist and where human beings are apparently far too few in number to maintain the continuous cycle of human host and vector, indicates that there is probably another animal host that acts not only as a reservoir but as a chronic carrier of the virus of yellow fever. If this is not so, then it must be that the virus can be maintained in vectors for long periods of time without recourse to man or animal hosts. Evidence is accumulating suggesting that there is an animal reservoir or chronic carrier, but we cannot be sure of this as yet. The important thing to remember is this: if vector and host or vector alone can keep yellow fever alive the year round in the sparsely settled areas of Brazil, could not this host or vector, or both, if transplanted and

*Read in Section on Public Health, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

†Medical Director, U. S. Public Health Service; Assistant to the Director, Pan American Sanitary Bureau.

adapted, do the same thing in Cuba, in Panama, in Mexico, in Texas, or in Florida? We do not know. But it requires no great stretch of the imagination to visualize such a possibility, particularly if it is the vector and not the animal host that is the factor in maintaining endemicity.

The diagnosis of yellow fever is important. I can remember when it was believed that an expert could make a diagnosis of yellow fever even in mild cases just from the clinical symptoms. After studying the disease in an endemic center from 1906 to 1910, I gave it up and said that I at least could not. Today we know that in endemic centers it frequently happens that the majority of cases occurring in the local population are unrecognized. Time and again in recent years by blood surveys and protection tests it has been found that yellow fever has occurred off and on for years in certain localities without its presence having been known.

When the presence of yellow fever is suspected but not definitely established in any community, it is of the utmost importance that the matter be determined with precision biologically. At the present time there are two and, in my judgment, only two dependable methods of accomplishing this. These methods are (1) the reproduction of the disease in animals by inoculation with the blood of the patient at a time when the virus is present in the circulation, and (2) the demonstration, also by animal inoculation, of the presence of protective antibodies in the blood of recovered cases. Of course these methods are not rapid, but they are positive. A third biological test, that of biopsy of the liver in fatal cases, while a quick method, should not, in my judgment, be accepted as conclusive evidence of the existence of the disease in isolated cases. I am not prepared to express an opinion with regard to the value of the complement-fixation test. I know of only one man who still clings to the idea that *Leptospira icteroides* is the exciting cause of yellow fever, and who accepts agglutination of this hypothetical organism as proof of the existence of yellow fever. Needless to say, I do not take him seriously, as will be brought out in another part of this paper.

The following incidents may serve to illustrate the importance of being right when a diagnosis of yellow fever is made or when the presence of the disease is excluded.

In August, 1930, the State Health Officer of Texas telegraphed the Surgeon General of the Public Health Service that a physician in San Benito, Texas, who had seen yellow fever, had made a positive diagnosis of this disease, based on post mortem findings in a case dying in the vicinity. Surgeon General Cumming at once detailed me to investigate and told me that if the disease proved to be yellow fever, he expected me to plan cooperative control measures and assume charge of them, if agreeable to state and local authorities. Upon arrival, I found that the authorities were prepared to accept the diagnosis and were already planning for the eradication of *Aedes aegypti* in the towns situated in the Rio Grande Valley. While I thoroughly approved of the proposal to combat *Aedes aegypti* mosquitoes, regardless of the accuracy of the diagnosis, I deemed it my duty to find out whether the diagnosis was correct and, if so, to discover the source of the infection and to find other cases if they existed. I had visions of quarantine by Mexico, Cuba, and other American republics and possibly a demand for interstate quarantine on the part of other Southern states, provided the diagnosis was confirmed and the disease reported as required by interstate and international obligations. After a detailed study of the clinical course of the disease, of the autopsy findings, of the previous history of the patient obtained from all possible sources, and of all other obtainable epidemiological evidence, I was forced to conclude that an error had been made in the diagnosis. After conferring with the State Health Officer, I wired the Surgeon General to suspend judgment, and not to report the case as yellow fever until further studies could be made. I then combed the valley towns for other suspicious cases. Finding none, I remained in the vicinity for about three weeks, keeping a sharp lookout for anything of a suspicious nature. As there were no further developments, I returned to Washington.

Guayaquil, Ecuador, was for many years an endemic center of yellow fever. In 1919 the Government of Ecuador, with the aid of the Rockefeller Foundation, succeeded in exterminating yellow fever not only from Guayaquil but from the entire republic. Later the disease was eradicated from all the American countries except Brazil, Bolivia, and Colombia, and possibly Venezuela. I believe that statement is true, but I will not guarantee it.

In August, 1929, Dr. Carbo, Professor of

Tropical Medicine of the Faculty of Medicine of Guayaquil, Ecuador, reported a case of yellow fever to the local authorities. In July, 1931, he reported another case, and in February, 1932, two more cases. All these patients recovered. Inasmuch as the diagnosis in these cases was based on clinical manifestations or agglutination of the so-called *Leptospira icteroides,* or both, the local authorities, doubting the diagnosis and also the existence of the disease in Ecuador, did not report them to the Pan American Sanitary Bureau.

In December, 1932, Dr. Carbo reported what he regarded as a fatal case of yellow fever. Portions of the liver from this case were sent by the Ecuadorian authorities to Dr. Oscar Klotz, Professor of Pathology and Bacteriology, of the University of Toronto, and by Dr. Carbo to both Dr. Klotz and Dr. Hoffman, of Habana. In addition Dr. Carbo sent specimens to others in different places. Both Dr. Klotz and Dr. Hoffman made a positive diagnosis of yellow fever, based on the pathological findings in the liver specimens.

In January, 1933, Dr. Carbo sent a report of the autopsy findings to the Director of the Pan American Sanitary Bureau, and informed the Director that Dr. Hoffman, of Habana, had concurred in the diagnosis of yellow fever. It was learned later that Dr. Klotz had also made a positive diagnosis of yellow fever in this case. Surgeon General Cumming, the Director of the Pan American Sanitary Bureau, and I went carefully over all the evidence submitted. After weighing this evidence, neither of us believed that the case was yellow fever, in spite of the pathological findings. To have accepted the diagnosis in this case would undoubtedly have meant quarantine against Ecuador on the part of a number of neighboring countries, including perhaps Panama and the Canal Zone. Accordingly, Surgeon General Cumming, as Director of the Pan American Sanitary Bureau, wrote Dr. Carbo a letter in which, among other things, he said:

"A diagnosis of yellow fever based on gross and microscopical pathological findings seems to be not wholly incontrovertible or at least not altogether free from the possibility of human error. * * * Because of the fact that the *Aedes aegypti* index is reported to me as being less than 1 per cent in Guayaquil, I have not deemed it necessary to report this case until further information may be available, preferring to await developments rather than perhaps precipitate a quarantine of the port by other countries."

On July 1, 1933, Dr. Carbo again reported a death from yellow fever in which Dr. Hoffman and Dr. Klotz concurred, basing their opinions on pathological findings in the liver. It was now decided to take the matter up with the Ecuadorian authorities, in spite of the fact that the same doubt existed with regard to this case. Surgeon General Cumming, Director of the Pan American Sanitary Bureau, wrote Dr. Carbo as follows:

"I deem it unsafe in sporadic cases to accept as final and irrefutable a diagnosis of yellow fever based on clinical symptoms and findings at necropsy."

At the same time Dr. Cumming wrote to the authorities in Ecuador, suggesting that a blood survey be made by representatives of the Rockefeller Foundation among persons born in Guayaquil since 1919, and also in other towns in the coastal regions of Ecuador. To this suggestion the Ecuadorian authorities readily agreed, inviting the Pan American Sanitary Bureau to send a representative to participate in the work, but this was not considered necessary. This survey has been made and so far has failed to confirm the existence of yellow fever in Ecuador, though Dr. Carbo has reported nine cases altogether which he still regards as having been yellow fever.

With regard to vaccination against yellow fever, may I say that when I learned that it was possible to determine by the mouse protection test whether or not a person had had yellow fever at some period of his life, I submitted my blood to the Rockefeller Institute, thinking that I was immune. I was not. Learning that a method of immunizing against yellow fever had been developed which was somewhat analogous to that used against hog cholera, with which I have had considerable experience, I early became convinced that lasting immunity to yellow fever could be produced artificially, and was very glad to submit myself to the process of immunization.

I cannot here go in detail into the results which have been obtained by the use of attenuated virus plus serum, and of attenuated virus alone, in immunizing against yellow fever. I will say, however, that I believe that immunization with attenuated virus and animal serum, or with attenuated virus alone, will in the near future be one of our most valuable aids in the

control of this disease, and also in enabling travelers to move about with impunity in infected regions without danger of contracting yellow fever. I believe also that it will be possible to permit artificially immunized individuals when properly identified to visit infected territory without subjecting them to quarantine when leaving it.

I may add in closing that if confronted with a yellow fever situation that I could not immediately control, I would not hesitate to use attenuated virus alone on a large scale in persons who were to be continuously exposed to the disease. Should it appear that persons vaccinated with an attenuated neurotropic virus without the use of serum may infect vectors of yellow fever, then those vaccinated in this maner could be kept in vector-free surroundings until all danger is past. Should it also develop that this method of vaccination is too dangerous to use, which I doubt when one considers the danger from the disease itself, the measure could be discontinued.

DISCUSSION (*Abstract*)

Mr. J. A. LePrince, U.S.P.H.S., Memphis, Tenn.—It is most important that we learn definitely as early as possible the particular species of mosquitoes which are involved in the transmission of yellow fever, and then that an intensive study be made of details relative to their life history, preferences and habits.

In recent years, with the improvement of methods of heating of buildings, *Aedes aegypti* were found propagating in a hotel in Illinois in the middle of winter, and we yet do not know the maximum length of life of this species under natural conditions.

The relatively recent epidemics of dengue fever in the Southern states indicate that our yellow fever mosquito is yet present throughout the Southland in sufficient quantities to be a decided potential menace and that precautions should be taken to change this condition. That it is possible to do so is indicated by the absence of spread of dengue at Laredo, Texas, while other towns had epidemics and many hundreds of people from those places visited Laredo during the epidemic.

Dr. Lloyd (closing).—In stressing the unknown vector and the unknown manner of transmission of the so-called "jungle type" of the disease in Brazil, I do not wish to be understood as intimating that it has been definitely shown that yellow fever is ever transmitted in the total absence of all kinds of mosquitoes. Insofar as I know, this has never been done. I frankly doubt that yellow fever is transmitted in nature by a vector other than a mosquito, but if anyone proves that it is, I will believe it.

NITROGEN RETENTION DUE TO HYPOTHYROIDISM*

REPORT OF CASE

By JOHN W. BOGGESS, JR., M.D.
Guntersville, Alabama

Since the determination of the basal metabolic rate has become a routine procedure with most physicians in the examination of patients, it has been found that dysfunction of the thyroid gland is much more common than was heretofore supposed. Hypothyroidism is as prevalent in the underweight, neurotic individual as in the obese, sluggish individual. As with other functional and organic disorders, symptoms and findings vary with individuals. For this reason it was of interest to observe a case of marked nitrogen retention which seemed to be due to mild hypothyroidism. It has been common in my practice to find some degree of nitrogen retention in hypothyroid cases (average around 40 mg. of nonprotein nitrogen per 100 c. c. of blood), but marked retention is very uncommon. In fact, I have never seen such great retention in any other case of hypothyroidism as in the one I am about to report, even in cases which have developed to the myxedema stage.

CASE REPORT

A white man, aged 27, height 66 inches, weight 132 pounds, a laboratory technician, complained of insomnia, nervousness, irritability, despondency, indefinite abdominal and back pains, forgetfulness, and lack of energy.

He said that he had not felt well since he was 16 years old, at which time he apparently stopped growing. He was able to wear the same clothing at 27 which he wore then. At about this time he began getting nervous, especially at night, and was unable to go to sleep before 1:00 or 2:00 o'clock. He felt "tired and groggy" on arising in the morning and extremely sleepy after the noon meal, with slight fullness in the head, but no definite headache. Lately all these symptoms had grown worse and he had had indefinite pains in the upper lumbar region of the back and over the entire abdomen, and had grown very despondent, irritable, and forgetful. About three or four years ago he noticed his gums receding and immediately consulted a dentist, who told him that there were no signs of pyorrhea. This condition had grown steadily worse until the condition became very marked. Three years previously the patient had a sudden at-

---

*Received for publication February 24, 1936.

BLOOD NITROGEN DURING THYROID TREATMENT

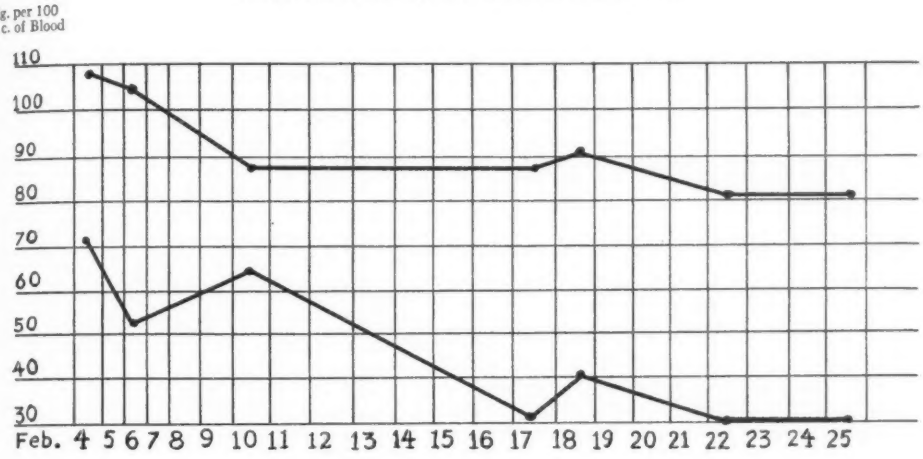


Chart 1

tack of acute pain in the upper lumbar region, which migrated down the ureter (left) and into the testicle on the same side. X-ray plate at the time showed a small calculus in the left ureter, which was later passed. The patient has not had a similar attack since.

His father was 54 years old, had passed fifty or more renal calculi since the age of 24, and pyelogram showed numerous calculi in both kidney pelves. The mother, 47, had been in fair health most of her life except for a persistent and annoying eczema (anaphylactic). Her basal metabolic rate on June 13, 1935, was minus 16. (Eczema cleared up promptly on thyroid medication.) The patient had a younger brother with the same type of eczema. The paternal uncle had a large renal calculus removed three years before by operation. His basal metabolic rate June 17, 1935, was minus 14. The paternal aunt had a mild toxic goiter removed about seven years before. The maternal uncle had receding gums like the patient's.

Physical examination was essentially negative except for marked recession of gums, marked nervousness and blood pressure 106/70 with pulse rate 60 per minute.

Laboratory examination February 4, 1936, gave the following results:

Blood nonprotein nitrogen, 70.6 mg. per 100 c. c.

Blood sugar, 108.0 mg. per 100 c. c.

Blood calcium, 10.0 mg. per 100 c. c.

Blood phosphorus, 3.2 mg. per 100 c. c.

Kidney function (phenolsulphonephthalein), 53 per cent in two hours.

Basal metabolic rate, minus 17.5 per cent.

Pyelogram showed kidneys of normal size and position, with no visible shadows.

Urinalysis showed specific gravity 1.018, albumin, sugar, indican, bile, and diacetic acid tests were negative; heavy trace of acetone. The reaction was slightly alkaline. There was an occasional hyaline cast. There were a few epithelial cells (squamous), and a few mucous threads.

Stomach and stool examinations were normal.

Blood count and smear were normal.

Chart 1 shows nonprotein nitrogen and sugar levels taken in mid-forenoon on various dates with and without thyroid medication, one grain of desiccated thyroid three times daily. The diet was not restricted.

February 4 to 6, thyroid; February 6 to 10, no thyroid; February 10 to 17, thyroid; February 17 to 18, no thyroid; February 18 to 22, thyroid; February 22 to 25, thyroid. Basal metabolic rate February 25, 1936, plus 1 per cent. Phenolsulphonephthalein output, 67 per cent in two hours. Blood pressure, 120/70.

With the interest and full cooperation of this patient it is believed that it has been definitely shown that marked nitrogenous retention may be due to hypothyroidism. The improvement in the patient's general physical and mental condition has been remarkable. His family history reveals a familial tendency to thyroid dysfunction and renal abnormalities. The patient's history indicates that his dysfunction probably began at about puberty. Hypothyroidism may be suspected in cases of nitrogen retention without definite evidence of kidney or heart damage.

THE USES OF COLPOSCOPY, WITH DEMONSTRATION OF A NEW COLPOSCOPE*

By GEORGE GELLHORN, M.D., F.A.C.S.†
St. Louis, Missouri

When Hinselmann, of Germany, designed his colposcope about ten years ago, he added a new chapter to gynecological diagnosis. This colposcope was a pair of powerful binoculars, attached to a large and heavy upright and provided with a strong electric lamp, so that he could inspect the cervix with brilliant illumination and under high magnification. With this instrument he could not only study in detail already known affections of the cervix, but he also detected even the minutest lesions which otherwise would have escaped the naked eye. In a number of cases he thus discovered cancer in the earliest stages yet encountered, a precious boon, indeed, since the cure of cancer rests to a large extent upon a timely recognition.

The practical value of any diagnostic appliance depends on the number of people who use it. If a stethoscope, for example, were not in everybody's hand, the diagnosis and treatment of cardiac or pulmonary diseases would be greatly handicapped. By the same token, the size, clumsiness and great expense of Hinselmann's colposcope militate against its universal adoption.

This fact justifies a modification of the original instrument which I hereby submit to the profession. The binoculars of my new scope, its supporting arms, the electric lamp holder, in fact, all metal parts are made of aluminum so that the entire appliance with the lamp cord weighs only eight ounces (*Fig. 1*). The source of light is a simple flash-light battery (which can be renewed at a negligible cost) or any current controller the examiner may happen to possess. The scope is attached to specially constructed and roomy automobile goggles which can easily be slipped on, even over one's own spectacles. The focus of the scope lenses is eight and one-half inches, so that there is a distance of at least three inches between the scope and the opening of the speculum; and as both hands are free, this means that the examiner cannot only see the cervix plainly and magnified, but he can also perform any instrumentation needed such as excising a suspicious lesion for microscopic examination.

Aside from its light weight and simplicity of construction, the cost of the scope is sufficiently low to be accessible to the great majority of interested physicians.

The magnification obtained with my scope is five diameters, which is not only sufficient for practical purposes, but has this advantage over still greater visual enlargement of the object that a suspicious area can be located with greater ease. Of course, the use of the colposcope requires practice, just as the microscope, the cystoscope or any other instrument of precision demands experience.

Fig. 1

I have also found other uses for the scope in my daily work. It was, for instance, a very simple matter to find and inject Skene's ducts in cases of gonorrhea, and in one case of Bartholinian abscess I was able to probe the duct of the gland and inject a silver nitrate solution. In proctoscopic examinations the instrument enabled me to see and treat small erosions in the anal canal. Finally, it seems probable that the scope will be found useful in delicate dissections in embryological and biological laboratories.

Metropolitan Building

*Read in General Clinical Session, Southern Medical Association, Twenty-Ninth Annual Meeting, St. Louis, Missouri, November 19-22, 1935.

*From the Barnard Free Skin and Cancer Hospital and the Department of Obstetrics and Gynecology, Washington University School of Medicine.

†Dr. Gellhorn died January 25, 1936.

A NEW DIRECT BLOOD TRANSFUSION INSTRUMENT*

By SIDNEY MEEKER, M.D.
Memphis, Tennessee

The transfusion assembly consists of a double three-way valve hinged to a base, an air piston type syringe, rubber tubings, modified Kaliski needles and a gravity intravenous outfit for normal saline solution (N.S.S.). The intravenous container and stand are not shown.

The syringe is attached to the valve by an easily detachable metal ECO "Luer grippur" connection. The tapered valve core is kept firmly in contact with the valve casing by a spiral spring held in place by a removable retaining clip.

No. 1 is a photograph showing the position of the valve core when the donor is bleeding into the barrel of the syringe. Sodium citrate solution (S.C.S.) floats on the blood as it enters the barrel. Normal saline solution (N.S.S.) is flowing through the valve core by gravity, independent of the syringe, to flush the tubing and needle of the recipient. Insert (A) shows a horizontal sectional drawing and insert (B) shows a vertical sectional drawing of the core in this position. Insert (C) is a horizontal sectional drawing of the valve core showing normal saline solution (N.S.S.) flowing to the recipient while the ports to the donor and the syringe are blocked. The needles shown are new modified Kaliski needles, the outer sheath being a cannula, the stilette being a needle.

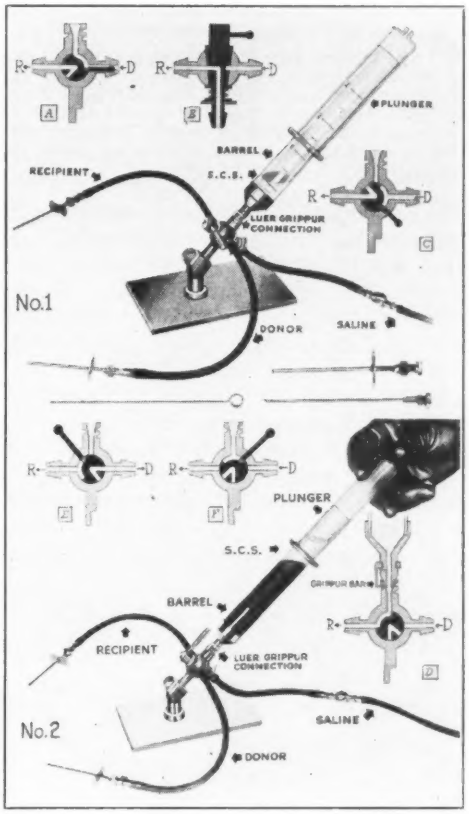
No. 2 is a photograph showing the position of the valve core when blood is being injected into the vein of the recipient. Insert (D) shows a horizontal sectional drawing of the valve core in this position. The ports to the donor and the normal saline solution (N.S.S.) are blocked. Insert (E) is a horizontal sectional drawing of the valve core showing normal saline solution (N.S.S.) flowing to the donor, while the ports to the syringe and the recipient are blocked. Insert (F) shows a horizontal sectional drawing of the valve core in the neutral position.

Operative Technic.—Boil the entire instrument (and keenly sharpened needles) for five minutes in a 0.1 per cent sodium hydroxide solution. Rinse thoroughly with triple distilled water and then with sodium citrate solution. This will help prevent the great majority of reactions.

The arms of the donor and recipient are draped and the assembled instrument is placed on a table between them. The barrel is loaded with sodium citrate solution (S.C.S.) to the (X) mark, by suction, through the tubing of the donor. The valve core is then rotated to the neutral position (see insert F).

The needles are inserted in the usual manner. On withdrawing the hollow needle stilette the cannula remains within the lumen of the vein. The vein of the recipient is connected first. The valve core is then rotated to the position shown in insert (C) and normal saline solution (N.S.S.) flows to keep the needle open. The vein of the donor is then connected and the valve core is rotated to the position shown in photograph 1. The donor instantly begins to bleed into the barrel. The rate of bleeding depends on the size of the vein, the systolic pressure of the donor and the size of the cannula needle. A good donor bleeds at the rate of about two c. c. per second. The sodium citrate solution (S.C.S.) floats on the blood as it flows into the barrel. At the same time normal saline solution (N.S.S.) is flowing through the valve core to flush the tubing and needle of the recipient (see inserts A and B). The rate of flow depends on the elevation of the saline container.

When the syringe is full of blood, the valve core is rotated to the position shown in photograph 2 (see insert D). The air passageway in the end of the plunger is closed by a thumb and the blood is ejected into the recipient. When the level of the sodium citrate solution (S.C.S.) reaches the zero (0) mark the valve core is rotated to the position shown in photograph 1. (The floating sodium citrate solution remains in the barrel.) The donor instantly begins to bleed another syringeful of blood. This technic is re-



peated until the determined quantity of blood has been given.

The proper insertion of the needle in a vein is very essential, especially in the vein of the donor. A vein of a donor that will not bleed freely into the barrel will not give a perfect transfusion. It is best to "stick" another vein. A vein that requires suction is not a good vein to use. A narrow strip of adhesive across the cannula prevents its being accidentally pulled out of the vein.

Advantages.—(1) The instrument is fool proof. The blood of the donor cannot accidentally be contaminated by the blood of the recipient.

(2) The normal saline solution flows through the valve, by gravity, and flushes the tubing of the recipient or the tubing of the donor independent of the syringe.

(3) The donor bleeds into the barrel. Only a poor donor requires suction. Suction is very apt to draw the wall of the vein against the bevel of the needle and block it.

(4) The plunger cylinder of this type syringe does not come in contact with the fluid in the barrel cylinder. This prevents sticking of the plunger when a viscid fluid such as blood is being used.

(5) Red blood cells are crushed between the wall of the barrel and the plunger of the regular Luer type syringe and a film of fibrin gathers, causing the plunger to stick. This film is scraped off by the plunger and passes on to the needle of the recipient to clog or partly clog it. This cannot happen with the air piston type syringe.

(6) The time of giving a transfusion is decidedly shortened because this type syringe does not stick up and have to be washed out.

(7) The column of air in the cylinders acts as an invisible air piston.

(8) The air piston is elastic and has a cushion effect.

(9) The length of the air piston can be increased or decreased at will by removing the thumb and sliding the plunger.

(10) The addition of a floating sodium citrate solution:

(1) Gives hydraulic action to the air piston.
(2) Acts as an antiseptic buffer between the blood and air.
(3) Prevents foaming of the blood in the syringe.
(4) Prevents the air from coming into contact with the blood.
(5) Prevents blood from adhering to the walls of the barrel cylinder.
(6) Prevents air from entering the valve and tubing to the recipient.

(11) The Meeker cannula, needle stilette type transfusion needle, leaves a cannula in the vein without having to cut down on it, except when the vein of the recipient is very small or collapsed.

(12) The double three-way valve will last indefinitely. The valve core is rustless steel. The valve casing is chrome plated brass. Unlike the regular Luer type syringe the air piston type syringe will not leak due to sterilizing. The replacement cost is no more than a high-grade regular Luer type syringe.

Southern Medical Journal

JOURNAL OF THE

SOUTHERN MEDICAL ASSOCIATION

Copyright, Southern Medical Association, 1936. Published monthly by the Southern Medical Association, Empire Building, Birmingham, Ala. Annual subscription $4.00. Single copies 35c each.

Entered as second-class matter at the Post Office at Birmingham, Ala., under Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized December 20, 1921.

M. Y. DABNEY, M.D., Editor
EUGENIA B. DABNEY, M.S., Associate Editor
C. P. LORANZ, Secretary, Treasurer and General Manager

Vol. 29 MAY 1936 No. 5

EDITORIAL DEPARTMENT

SOUTHERN MEDICAL ASSOCIATION
Thirtieth Annual Meeting
Baltimore, Maryland, November 17-20, 1936

LIVER EXTRACT AND INTESTINAL FUNCTION

A group of patients with sprue, according to Miller and Rhoads,[1] of the Rockefeller Institute, were greatly benefited by treatment with liver extract. Even in the absence of anemia, however, intestinal symptoms such as cramps, flatulence and diarrhea occurred, and these were greatly improved by liver therapy. The intestinal abnormalities of sprue, say these authors, give an x-ray picture characterized by abnormal motility which shows in a segmental distribution of barium, variation in the contour and caliber of the intestinal segments and distortion of the mucosal pattern of the duodenum, jejunum and often the ileum, and a terminal ileum which is too straight and seems unpliable. Intramuscular injections of liver extract greatly improve the intestinal symptoms and the x-ray picture. Patients with sprue and with pellagra require a larger quantity of liver extract for maintenance than do patients with pernicious anemia.

1. Miller, D. K.; and Rhoads, C. P.: The Effect of Liver Extract on the Small Intestines of Patients with Sprue. Amer. Jour. Med. Sci., **191**:453 (April) 1936.

Faust[2] and his associates at Tulane University reported some years ago that oral administration of raw liver and of liver extract was beneficial in control of acute amebic enteritis in dogs. Parenteral injections of liver and of extract, they say, does not improve the condition.

Investigators at Harvard[3] report a growth-inhibiting principle which may be extracted from liver, and which diminishes the growth rate of several varieties of tissue in culture media. It inhibited the growth of fibroblasts, including malignant fibroblasts of a mouse sarcoma. This, of course, suggests a line of experimentation in cancer treatment.

The liver is a storehouse of potent biologicals, knowledge of the usefulness of which was greatly stimulated by discovery of the material which arrests pernicious anemia. Some of the liver principals would seem to be active by mouth only, some by parenteral injection only, and some by either route. Studies on sprue and amebiasis suggest a direct therapeutic effect of liver extract on the intestinal tract.

SEX AND AN ARTERIAL DISEASE

There have been various attempts to relate thrombo-angiitis obliterans to typhus fever and to the use of tobacco. According to New York workers, the disease occurs chiefly in men whose blood sera contain antibodies against the organism of typhus fever.[4] There also have been many laboratory attempts to explain why this particular inflammation of the inner coat of the artery affects men, not women; and various types of experimental gangrene of the extremities have been studied with a view to their possible prevention with the female sex hormone, theelin. The pathology of thrombo-angiitis is said to resemble that of ergot gangrene. Dur-

2. Faust, Ernest Carroll; and Schwartzwelder, J. C.: The Use of Liver Extract Intramuscularly in the Course of Acute Amebiasis in Dogs. Proc. Soc. Exper. Biol. & Med., **33**:514 (Jan.) 1936.

3. Brues, A. M.; Jackson, E. B.; and Aub, J. C.: Growth Inhibitor in Liver Tissue. Proc. Soc. Exper. Biol. & Med., **34**: 270 (March) 1936.

4. Edtorial. Prevention of Gangrene. THE JOURNAL, **28**: 861, 1935. Goodman, Charles; and Brodie, Maurice: A Test for Diagnosis of Thrombo-angiitis Obliterans. Proc. Soc. Exper. Biol. & Med., **32**:1331, 1935.

ing human epidemics of ergot poisoning, gangrene of the extremities is noted in men only, and because of this difference in sex susceptibility, investigators have attempted to prevent ergot gangrene during the experimental intoxication of animals by repeated injections of theelin. Theelin was said not to prevent the development of ergot gangrene in injected male rats, but to prevent it in females.[1]

Friedlander, Silbert and Laskey[2] attempted to induce gangrene of the toes, like the ergot gangrene and that of thrombo-angiitis obliterans, in several species of animals by injections of tobacco. The condition could not be produced by this means in rabbits; but it was induced in the majority of a group of male albino rats by daily administration of nicotine, and in one of the males following inhalation of nicotine fumes. None of a dozen female rats similarly injected showed this lesion. There was thus a sex difference in the response of the rat arteries to nicotine and ergot, greater resistance being on the female side.

A few years ago it was reported that ovarian hormones were effective in treating congenital hemophilia of young boys, but this method apparently was not confirmed. Theelin has been employed in many recent physiologic studies. It has been noted that it has a general vascularizing effect, increases the blood supply of the entire body, in addition to its specific effect upon the sex apparatus. It would appear that there are perceptible differences in the reactions of the blood vessels of male and female animals, and that theelin may be one of the controlling elements. It is at present one of the most available of the hormones for experimental studies. Possibly its importance in a number of reactions is exaggerated by the fact that it is very easy to secure a supply; and the fact that it has been crystallized adds to its attractiveness for investigators. When the male hormone, the ovarian corpus luteum hormone, and the adrenal cortical hormone, for examples, are more readily obtainable, they may be assigned a nearly similar list of beneficial effects.

1. McGrath, E. J. G.: Experimental Peripheral Gangrene: Effect of Estrogenic Substance. Relation to Thrombo-angiitis Obliterans. Arch. Int. Med., **55**:942 (June) 1935.

2. Friedlander, Mae; Silbert, S.; and Laskey, N.: Toe Lesions Following Tobacco Injections in Rats. Proc. Soc. Exper. Biol. & Med., **34**:156 (March) 1936.

GLEANINGS FROM RECENT JOURNALS

Prevention of Infantile Paralysis by Chemical Antisepsis.—The olfactory nerve in the nose is believed to be the normal portal of entry of the virus of poliomyelitis. Immune serum does not protect against the disease, probably because it cannot guard the terminals of this nerve. Obviously an antiseptic which protects the nerve endings against the virus might prevent the disease, and a number of experiments have been undertaken toward prophylaxis by this means. Protection against intranasal infection has been reported following nasal irrigations with 4 per cent alum, 4 per cent tannic acid, picric acid, *p*-nitrophenol, trinitrocresol, and mercurochrome. Nasal irrigations of monkeys by this means provided an immunity which resisted intranasal instillations of the virus for from two to sixty-nine days.[1]

In an epidemic of the disease, this method of protection, which, whether effective or not, is both simple and harmless, would no doubt be popular.

Exciting the Human Fetus.—That sudden shock or fear on the part of the pregnant woman could affect an infant *in utero* has been denied by the medical profession for a number of years, and the possibility of prenatal influences has been scouted. The fetal senses, sight, hearing, and so on, are generally believed to develop after birth and the infant in the womb is usually considered to be completely insulated from outside turmoil. In 1927, however, it was reported that the human fetus is capable of hearing sound. A woman who attended concerts felt greatly increased fetal movements when the audience applauded, and following other noises. Tactile response has been demonstrated in the fetus before the third month of intra-uterine life. Periodic extreme terror on the part of a pregnant woman living with an insane husband, in another reported case, resulted in violent fetal movements.[2]

Sontag and Wallace[2] have developed a technic for estimating small variations in the fetal heart rate. They note that the heart beat in-

1. Schultz, E. W.; and Gebhardt, V. P.: Prevention of Intranasally Inoculated Poliomyelitis in Monkeys by Previous Intranasal Irrigations with Chemical Agents. Proc. Soc. Exper. Biol. & Med., **34**:133 (March) 1936.

2. Sontag, L. W.; and Wallace, R. F.: Changes in Rate of the Human Fetal Heart in Response to Vibratory Stimuli. Amer. Jour. Dis. Child., **51**:583 (March) 1936.

creases in rapidity from the fifth month before birth, and that the rate also increases temporarily in response to certain stimuli; in particular they studied the effect of vibratory stimulation. Even fetuses which fail to respond with bodily movements show an increase in the heart rate upon application of vibrations of 120 per second to the abdomen of the mother during the latter part of pregnancy. It is suggested that this response of the heart may be used as an index of normal fetal development. In certain journals of child psychology, attempts to condition the unborn fetus have been reported.

Culture of the Gonococcus.—The dates of discovery of certain varieties of culture media might be chosen to mark off bacteriological epochs. The use of solid media in 1882 and thereafter made possible the growth of bacteria from a single colony and the isolation of pure cultures of a single micro-organism. It was followed in a few years by isolation of the causative agents of a number of the most dreaded plagues of mankind. Possibly later years will consider equally significant the introduction of the use of the hen's egg as a culture tube. It was used by students of embryology and pathology before the beginning of this century, to observe the behavior of transplanted tissues.[1] It has recently greatly advanced the knowledge of virus diseases and of other micro-organisms difficult to cultivate on the media which were formerly most popular. The egg offers a sterile living mixture of essential foodstuffs, protected against outside contamination and against dehydration.

The gonococcus was first isolated in 1885; however, it does not grow readily on the usual laboratory media. It has been noted that it remains viable in the interior of the hen's egg for several weeks or more and multiplies in the yolk. The incubation temperature of the egg is favorable for development of the Neisserian organism. If the yolk of a developing egg is inoculated, the gonococcus grows, apparently in some cases killing the embryo. Bradford and Titscher[2] report recovery of the gonococcus from the heart's blood of chicks which died after egg inoculation. They were unable to cultivate it from the heart blood of chicks which survived the infection. They suggest the routine use of the whole egg for keeping the gonococcus and for cultivating it from such sources as human joint fluid.

Stomach and Anemia.—The human stomach is often reported to be vital in maintenance of a normal blood picture and prevention of pernicious anemia. Pernicious anemia may follow gastrectomy, and the stomach secretion of patients suffering with this disease is deficient. Workers at Northwestern University[1] removed the stomachs of young monkeys in order to study the subsequent blood picture. The animals lost weight for about three months, then regained it. A hypochromic anemia developed after about six months. Two of the animals, more anemic than the rest, were given an iron compound which greatly improved their blood counts. All received a normal varied diet and remained about like normal animals during the period of observation. The bones were normal to x-ray. The iron deficiency anemia was like that of dogs, pigs and rats after gastrectomy, and the average blood count of the animals after one to two years was not markedly abnormal. They survived remarkably well without their stomachs. Increased quantities of iron would appear to be needed in certain cases of failure of stomach secretion. This work suggests that in the monkey normal utilization of this mineral is closely related to stomach function, but that loss of the stomach may be compensated for to a considerable extent by other tissues.

1. Goodpasture, E. W.: Use of Embryo Chick in Investigation of Certain Pathological Problems. THE JOURNAL, **26**:418, 1933.

2. Bradford, W. L.; and Titscher, R.: Experimental Gonococcal Infection in the Chick Embryo. Proc. Soc. Exper. Biol. & Med., **34**:241, 1936.

TWENTY-FIVE YEARS AGO

FROM JOURNALS OF 1911

Peristaltic Hormone.[2]—"A German physician named Starling has invented the word 'hormone' as a general term covering the elements derived from various tissues, glands or organs of the animal body and which possess definite power to influence physiological action. * * * A comparatively recent * * * development * * * is the use of a hormone which has the specific action of stimulating the peristaltic function.

"It is supposed to be generated by the gastric mucous membrane during the most active period of digestion. * * * It is administered by intravenous injection and is promptly followed by energetic intestinal peristalsis. * * * Like salvarsan, this seems to be a one-dose treatment, a single injection establishing the per-

1. Bussabarger, R. A.; and Ivy, A. C.: Hematologic Studies on Gastrectomized Monkeys. Proc. Soc. Exper. Biol. & Med., **34**:151 (March) 1936.

2. Editorial. Hormone Therapy. Sou. Med. Jour., **4**:516, 1911.

istaltic habit in about 70 per cent of the cases thus far tried. It has been used for a few cases of post-operative intestinal paresis, successfully, and seems to offer a much needed relief. * * *

"* * * Along the line suggested by these investigations lie many of the most brilliant triumphs of the science of medicine in the near future."

Indications for Turbinectomy.[1]—"It seems that the operation of turbinectomy, like many other operations, is enthusiastically supported by some surgeons and as enthusiastically condemned by others. This difference of opinion can be attributed largely to too extravagant claims made for the operation; also in a few instances the operation is not fully appreciated. There can be no doubt of the value in surgery of a properly performed turbinectomy, and in the class of cases indicated it is difficult to give relief by other means.

"Among chief indications for the operation may be mentioned hypertrophic rhinitis, pharyngitis, laryngitis occasionally, hay fever and asthma, muco-purulent conjunctivitis, due to imperfect drainage through lachrymal canal, blepharitis, etc., acute and chronic catarrh of middle ear, deafness, tinnitus, etc., headache and general debility resulting from imperfect breathing."

Virulence of the Colon Bacillus.[2]—"The virulency of the colon bacillus is now quite generally recognized. The major part of the diseases of the intestinal tract are caused primarily by the virulency of the B. Coli.

"The degree of the virulency can be determined by cultures taken from the ileum or cecum and fed to rats.

"Immunity, or partial immunity, can be established by the use of vaccines.

"Where the thyroid gland is deficient, the giving of thyroid substance will reduce virulency.

"Symptoms are variable in different patients.

"Cultures are taken from the lower ileum or cecum, the area of greatest bacterial activity. One-half to one c. c. of a bouillon culture of non-virulent B. Coli can be injected into the peritoneum of a rat without any marked effect, but if the virulency is well marked, death will follow. * * *

"Irish moss and agar agar, with vaseline, cooked into a jelly and flavored, will do much to reduce the virulency of the B. Coli.

"Lavage of the stomach and colon will not only have a beneficial local effect, but will produce changes in the chemistry of the blood. Hot baths have a like effect, to a less degree."

Need of Medical Organizations.[3]—"This is an age of organization. Lawyers have bar associations. Preachers have synods and conferences. The press has a mighty association. The very bootblacks are organized. There are as many different organizations as there are trades, callings, professions, or religious beliefs. * * * The working men wield their unions as weapons of defense against oppression. * * * Manufacturers decree the total output, divide the fields of influence and fix their prices just within the limits of the tariff fence, along whose fertile lines they flourish worse than poke-root or gympson weed. * * * No organization of doctors that I have ever heard of exists for the purpose of rendering their labors less arduous, adding to their fees in any way, or for doing anything towards insuring payment for services rendered.

"* * * Preachers and lawyers might abandon their organizations, corporations might yield their charters, unions might disband, but still the work of the world would somehow go forward and society would continue to exist. But once let the protecting arm of medicine, which now so skillfully, so silently, but so surely holds back from our shores that unseen danger, be withdrawn, and before twelve months could pass over our heads * * * the blackest days of history might be again enacted * * * the foundations of society would for a while crumble in anarchy. * * * It is, therefore, to the interest of all that the efficiency of medical organization shall be maintained."

"Cotton Mill Anemia."[4]—"That there is a widespread and severe anemia found among cotton mill hands in certain portions of the United States is evident to any person who visits a large number of the mills. * * * One of the most frequently advanced theories is that it is due to 'breathing in the lint.' * * * I have personally seen more than 2,000 cases and suspects in the Southern cotton mills, but not a single case or suspect in the New England mills. * * *

"* * * mills with clay land and city labor show the lowest percentage of suspects; * * * mills with sand land labor stand in general intermediate between the sand mills and the clay mills; and * * * mills with mountain-and-clay show a higher percentage of suspets than do the clay land mills * * * these general rules are * * * in harmony with the idea that this widespread anemia of the mills in question is due to hookworm disease, for in our country this malady is preeminently a disease of the sandy regions, and is relatively less frequent in the clay regions; in mountainous regions it increases over the clay regions.

"This widespread and severe Southern 'cotton mill anemia' has nothing to do with working in the cotton mills, but is directly traceable to other factors, namely: it is hookworm disease, contracted in the majority of cases on the farms; it is due largely to the present insanitary conditions existing in the rural districts, and is brought to the mills by the people who come from the farms. * * * Life under the improved sanitary conditions of the average Southern cotton mill is better (from a public health point of view) than life as a tenant on a soil-polluted one-horse farm, such as those from which so many of these people come."

1. Vaughan, G. E.: Operation of Turbinectomy and Method of Packing. Sou. Med. Jour., 4:436, 1911.

2. Turck, Fenton B.: Diseases Produced by the Bacillus Coli Communis in the Intestines: Etiology, Diagnosis and Treatment. Sou. Med. Jour., 4:432, 1911.

3. Moody, H. A.: Monitor's Address Before the Medical Association of Alabama, Montgomery, 1911. Sou. Med. Jour., 4: 394, 1911.

4. Stiles, Charles Wardell: Is the So-Called "Cotton Mill Anemia" of the Gulf-Atlantic States Due to Lint or to Hookworms? Sou. Med. Jour., 4:508, 1911.

Book Reviews

Synopsis of Clinical Laboratory Methods. By W. E. Bray, B.A., M.D., Professor of Clinical Pathology, University of Virginia; Director of Clinical Laboratories, University of Virginia Hospital. 324 pages, illustrated. St. Louis: The C. V. Mosby Company, 1936. Cloth, $3.75.

The importance of the clinical laboratory in modern medicine cannot be minimized. The laboratory may furnish the diagnosis or at least clinch it. This book brings the recent developments and modifications of laboratory tests to the busy practitioner in synopsis form. In the first few pages the writer gives a list of disease conditions and the laboratory procedures that will be of value in treating the case. The technic described includes methods in common use and is clear and of sufficient detail. The illustrations are well drawn and selected. This is a very good book.

The True Physician: The Modern "Doctor of the Old School." By Wingate M. Johnson, M.D. 157 pages. New York: The Macmillan Company, 1936. Cloth, $1.75.

A general practitioner advises the student on the practice of medicine in this book. Dr. Johnson discusses the types of practice, selecting the location, the equipment and one's conduct. The chapter on ethics has many comments of value. No doubt the tyro can get along without this book, but a knowledge of the subject will be helpful.

Manson's Tropical Diseases: A Manual of the Diseases of Warm Climates. Edited by Philip H. Manson-Bahr, D.S.O., M.A., M.D., D.T.M. and H. Cantab. F.R.C.P. (Lond); Physician to the Hospital for Tropical Diseases, London, the Albert Dock Hospital and the Tilbury Hospital. Tenth Edition. 1003 pages, illustrated. Baltimore: William Wood & Co., 1936. Cloth, $11.00.

This is the classic book on tropical diseases. A great deal of new material that has accumulated in the past six years has been added. Medical zoology has been limited to those portions of the subject that have a direct bearing on tropical medicine. The volume is more practical, as great strides have been taken in treatment and more potent drugs have been evolved. Every practitioner in the South should be familiar with this book.

The Obstetric Pelvis. By Herbert Thoms, M.D., F.A.C.S., Associate Professor of Obstetrics and Gynecology, the School of Medicine, Yale University. 115 pages, illustrated. Baltimore: The Williams & Wilkins Company, 1935. Cloth, $2.50.

The author has treated the subject material in such complete detail as to render the correlation of roentgenographic studies and clinical observations most striking. Throughout the volume, emphasis is placed upon the necessity and practical application of knowledge of the bony pelvic structure to progressive obstetrics. The chapters on pelvimetry, variations in the female pelvis, pelvic variations and the course of labor, the funnel pelvis, the diagnosis of disproportion and fetal cephalometry *in utero* are of especial interest and most valuable. If there is a weakness in the treatise it is the impracticability of use of the methods by the physician in private practice. The essential x-ray equipment and highly specialized roentgenologist necessary for the work advocated demands an economic premium that is prohibitive for the average private practitioner and patient. However, much valuable information may be gleaned from the presentation and the thoughtful obstetrical attendant can profit very materially from the author's words of advice that are irrefutable. The volume is heartily recommended for study.

The Diagnosis and Treatment of Diseases of the Peripheral Arteries. By Saul S. Samuels, A.M., M.D., Chief of the Clinic for Peripheral Arterial Diseases, Fourth Division, Bellevue Hospital, New York. 260 pages, illustrated. New York: Oxford University Press, 1936. Cloth, $3.50.

This small manual is timely, in view of the renewed interest in peripheral vascular diseases. It deals principally with organic obliterative diseases of the arteries and refers the reader to works on surgery for the technic of operations on the sympathetic nervous system in the vasomotor disturbances.

The chapters on symptoms and signs are excellent, and if followed the diagnosis of the majority of peripheral vascular diseases can be made by simple office procedures in the course of a thorough physical examination.

To support his optimistic views on thrombo-angiitis obliterans, the author offers his end results in a large series of cases treated by conservative methods. He regards rest and cessation of smoking as essential in the treatment of all stages of this disease. Intravenous hypertonic saline solution intravenously is his method of choice for the stimulation of collateral circulation.

The chapter on arteriosclerosis obliterans is rather brief. Hypertonic saline solutions are also used in these cases, provided there is no history of coronary attacks or nephritis.

Passive vascular exercises in arteriosclerosis, approved recently by several clinics, are not recommended, because of the risk of dislodging thrombi in the larger arteries.

The monograph is a worth-while addition to any medical library.

Spanish Influence on the Progress of Medical Science, with an Account of the Wellcome Research Institution and the Affiliated Research Laboratories and Museums Founded by Sir Henry Wellcome, LL.D., D.Sc., F.R.S. Commemorating the Tenth International Congress of the History of Medicine Held at Madrid, 1935. The Wellcome Foundation, Limited, London, England.

Complimenting the Tenth International Congress of the history of medicine, the Wellcome Foundation published this small book. The first half is devoted to a history of Spanish medicine and the last half describes the Wellcome institutions. Nicely printed and bound, it is well worth having in one's library.

Medical Mycology: Fungous Diseases of Men and Other Mammals. By Carroll William Dodge, Ph.D., Mycologist, Missouri Botanical Garden; Professor, Henry Shaw School of Botany, Washington University, St. Louis. 900 pages, illustrated. St. Louis: The C. V. Mosby Company, 1935. Cloth, $10.00.

Botanical methods of identifying plants sooner or later interest the lover of wild flowers. Perhaps to his astonishment he finds the botanist is more concerned with structural form than he is with tints of flowers or cultural requirements, and he learns that unless technical terms and botanical principles are mastered one has trouble in recognizing wild flower acquaintances in such a book as, for example, Small's "Manual of Southeastern Flora."

If this is true of identification of large plants, the difficulty of distinguishing micro-botanical specimens becomes even more pronounced, although the student in this field has not only studies of structural form to aid him, but also methods of distinguishing fungi by cultural characteristics.

Dodge, of St. Louis, has produced an admirable work dealing with micro-botanical plants or molds. Sabouraud was the first to undertake this work on an extensive scale. Great progress has been made in research since his work appeared and this volume admirably correlates present day knowledge of the subject. As a reference work it will be of great value to laboratory workers.

Modern Treatment in General Practice, Volume II. Edited by Cecil P. G. Wakeley, D.Sc., F.R.C.S., F.R.S.E., Fellow of King's College, London, Editor of the Medical Press and Circular. 382 pages, illustrated. Baltimore: William Wood & Co., 1935. Cloth, $4.00.

This volume is the second collection of a series of articles which were first published in the Medical Press and Circular. Each deals with some phase of medicine or surgery deemed of interest to the general practitioner. The authors are well known men and their writings show experience, individuality and the more recent advances in the subject. Diagnosis and treatment have been emphasized. The book will be found most useful by the general practitioner.

A Text-book of Bacteriology. By Thurman B. Rice, A.M., M.D., Professor of Bacteriology and Public Health at the Indiana University School of Medicine. 551 pages, illustrated. Philadelphia: W. B. Saunders Company, 1935. Cloth, $5.00.

This is a practical text-book of bacteriology. For material which is of debatable nature, long technical procedures and detailed cultural characteristics the reader is referred to larger texts. The laboratory procedures described are those that the physician can do in his own office with limited time and equipment. The subject matter is well presented and clearly illustrated. The book contains the fundamental knowledge that is needed in the treatment and control of bacterial diseases. The compactness of the presentation should make the book attractive to both practitioner and student.

Southern Medical News

ALABAMA

Dr. James S. McLester, Birmingham, President of the American Medical Association, was one of the honor guests at a banquet given by the Dade County (Miami, Florida) Medical Society recently. He was also a recent guest speaker before the Hillsboro County (Tampa, Florida) Medical Society.

Dr. Roy R. Kracke, Emory University, Georgia, lectured at the University of Alabama School of Medicine, University, on March 14.

Dr. William D. Burkhalter, formerly of Nashville, Tennessee, has been made Health Officer of the newly organized Health Department of Coosa County.

Dr. Robert E. Harper, Moulton, has been made Health Officer of Colbert County.

Dr. Clarence Vearn Partridge and Miss Edith Anne Pritchard, both of Mobile, were married January 21.

Deaths

Dr. Monroe Aaron Maas, Selma, aged 47, died January 3 of coronary thrombosis.

Dr. Emmett Lee Fuller, Demopolis, aged 61, died January 16 following an operation for renal calculus.

Dr. Henry T. Dickens, Wilsonville, aged 71, died January 8.

Dr. Hardy David Havard, Theodore, aged 46, died January 15 of carcinoma of the esophagus.

Dr. Eldridge G. McAlvin, Haleburg, aged 92, died January 24 of pneumonia.

ARKANSAS

Sebastian County Red Cross Chapter has elected the following officers for the coming year: Dr. F. H. Krock, Fort Smith, President; Dr. A. F. Hoge, Dr. W. G. Eberle, Dr. J. A. Foltz and Dr. S. J. Wolfermann, all of Fort Smith, Directors.

St. Francis County Medical Society has elected the following officers for the coming year: Dr. C. V. Powell, President; Dr. J. S. Davidson, Forrest City, Vice-President; Dr. J. O. Rush, Forrest City, Secretary-Treasurer.

Ashley County Medical Society has elected the following officers for the coming year: Dr. M. C. Crandall, Wilmot, President; Dr. L. C. Carnes, Hamburg, Vice-President; Dr. A. M. Gibbs, Hamburg, Secretary-Treasurer.

Dr. Val Parmley, Little Rock, was recently made Vice-President for Arkansas of the Mid-South Postgraduate Medical Assembly.

Dr. John M. Smith, Russellville, has been made Chairman of the Crippled Children's Association of Pope County.

Dr. J. T. Powell has been made a Director of the Gravette Community Club.

Dr. J. B. Jameson, Camden, has been elected President of the School Board of that city.

Dr. Roy Millard, Dardanelle, has been made a Steward in the First Methodist Church.

Dr. A. A. Blair was recently made School Director at Fort Smith.

Dr. H. O. Walker, Newport, has been elected Mayor of that city.

The Arkansas State Pediatric Association met in Hot Springs National Park April 27.

Dr. Henry Ritterman, Norphlet, is in New York City doing postgraduate work.

Dr. R. B. Robins, Camden, now has associated with him Dr. Edwin Byrd, formerly of Fordyce.

The Union County Medical Society had as guest speaker at its meeting on March 3rd Dr. Willis Campbell, Memphis, Tennessee.

Deaths

Dr. Millard F. Powell, Little Rock, aged 75, died January 10.

Dr. James Madison Muse, Conway, aged 68, died February 25 of pneumonia.

DISTRICT OF COLUMBIA

Dr. Charles O. McCormick, Indianapolis, Indiana, recently lectured at Georgetown University School of Medicine.

Dr. Enoch Raymond Fenton and Miss Margaret Isabel Conway, both of Washington, were married recently.

Continued on page 24

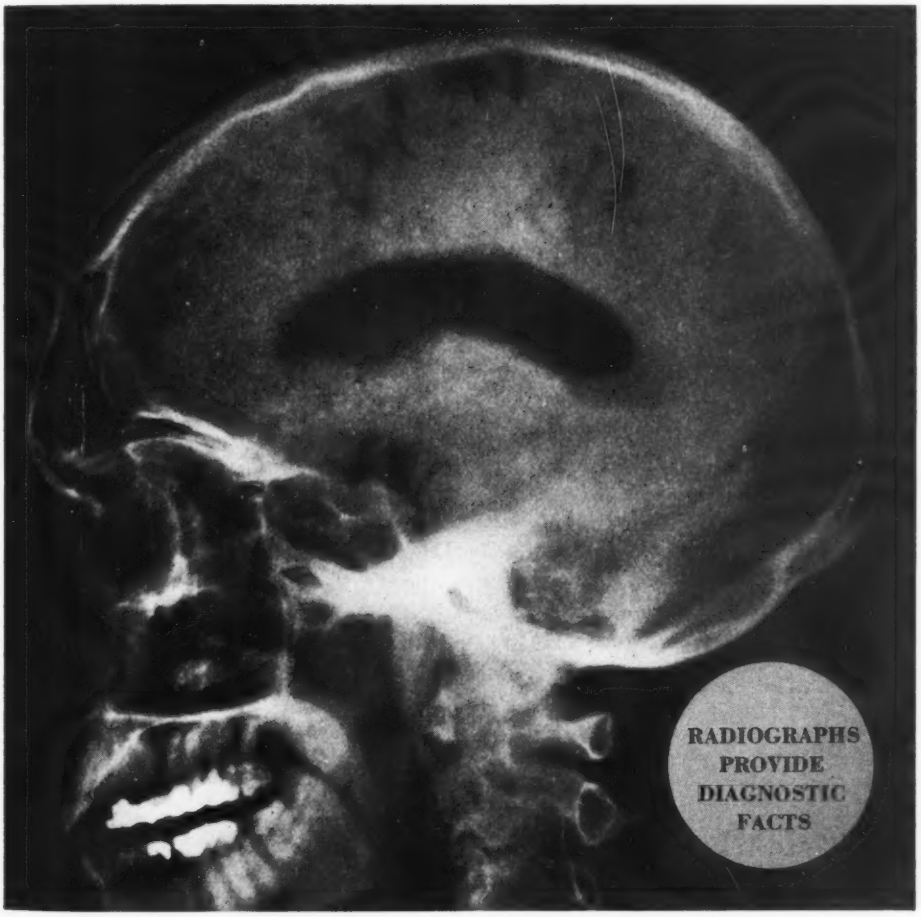
When Clinical Evidence Is Not Conclusive

IN certain types of cerebral pathology, where definite clinical diagnosis is impossible, the true condition often can be established by encephalography . . . Especially is this true in differential diagnosis of midbrain lesions. Encephalograms are invaluable to establish the nature of the involvement and to localize it.

Encephalography will confirm the diagnosis of cerebral tumor or definitely exclude it, which is equally important. It makes possible correct conclusions and often prevents inadvisable cranial surgery.

As an adjunct to clinical neurology, encephalography is an indispensable procedure. In all doubtful cases, be sure your conclusions are checked by a thorough x-ray examination.

EASTMAN KODAK COMPANY, *Medical Division*, Rochester, N.Y.



Continued from page 546

DEATHS

Dr. William H. Wenger, Washington, aged 66, died January 29 of cerebral hemorrhage and cardiovascular renal disease.

FLORIDA

Volusia County Medical Society has elected the following officers for the coming year: Dr. H. W. Henry, New Smyrna, President; Dr. J. Ralston Wells, Daytona Beach, Vice-President; Dr. W. C. Chowning, New Smyrna, Secretary-Treasurer.

Orange County Medical Society has elected the following officers for the coming year: Dr. William E. Sinclair, Orlando, President; Dr. F. H. Harms, Orlando, Vice-President; Dr. J. A. Pines, Orlando, Secretary; Dr. Spencer A. Folsom, Orlando, Treasurer.

Bay County Medical Society has elected the following officers for the coming year: Dr. W. C. Roberts, Panama City, President; Dr. J. M. Nixon, Panama City, Vice-President; Dr. Allen H. Miller, Millville, Secretary-Treasurer.

Dr. Julius C. Davis, Quincy, has been made a member of the State Board of Medical Examiners to succeed Dr. Eugene G. Peek, Ocala.

Dade County Medical Society recently honored Dr. James S. McLester, Birmingham, Alabama, President of the American Medical Association, Dr. Herbert L. Bryans, Pensacola, President of the Florida Medical Association, and Dr. Julius C. Davis, Quincy, Past President of the Florida Medical Association, at a banquet.

Dr. Carlos P. Lamar, Miami, has opened offices in the Ingraham Building.

Hillsborough County Medical Society had as guest speaker at a recent meeting Dr. James S. McLester, Birmingham, Alabama.

Dr. Sam Roberts, Miami, has moved to the Ingraham Building.

Dr. Edwin Preston, Miami Beach, and Miss Josephine Montanus were married recently.

Dr. John A. Simmons, Arcadia, and Mrs. Erma T. Lambert were married February 18.

DEATHS

Dr. S. H. Toy, Umatilla, aged 85, died recently.

GEORGIA

Wilkes County Medical Society has elected the following officers for the coming year: Dr. H. T. Harriss, Washington, President; Dr. H. M. Sale, Sharon, Vice-President; Dr. A. W. Simpson, Washington, Secretary-Treasurer.

Cobb County Medical Society has elected the following officers for the coming year: Dr. W. G. Crawley, Acworth, President; Dr. W. C. Mitchell, Smyrna, Vice-President; Dr. H. B. Terry, Acworth, Secretary-Treasurer.

Wayne County Medical Society has elected the following officers for the coming year: Dr. T. G. Ritch, Jesup, President; Dr. J. T. Colvin, Jesup, Vice-President; Dr. A. J. Gordon, Jesup, Secretary-Treasurer.

Sumter County Medical Society has elected the following officers for the coming year: Dr. A. C. Primrose, Americus, President; Dr. R. C. Pendergrass, Americus, Vice-President; Dr. Arch Avary, Jr., Ellaville, Secretary-Treasurer.

Chattooga County Medical Society has elected the following officers for the coming year: Dr. R. E. Talley, Trion, President; Dr. H. D. Brown, Summerville, Vice-President; Dr. Inman Smith, Trion, Secretary-Treasurer.

Douglas County Medical Society has elected the following officers for the coming year: Dr. C. V. Vansant, Douglasville, President; Dr. R. E. Hamilton, Douglasville, Secretary-Treasurer.

Monroe County Medical Society has elected the following officers for the coming year: Dr. W. J. Smith, Juliette, President; Dr. J. O. Elrod, Forsyth, Vice-President; Dr. G. H. Alexander, Forsyth, Secretary.

South Georgia Medical Society has elected the following officers for the following year: Dr. H. W. Clements, Adel, President; Dr. L. R. Hutchinson, Adel, Secretary-Treasurer.

Jenkins County Medical Society has elected the following officers for the coming year: Dr. H. G. Lee, Millen, President; Dr. Q. A. Mulkey, Millen, Vice-President; Dr. C. Thompson, Millen, Secretary-Treasurer.

Tattnall County Medical Society has elected the following officers for the coming year: Dr. J. C. Collins, Collins, President; Dr. A. C. Branch, Glennville, Vice-President; Dr. J. M. Hughes, Glennville, Secretary-Treasurer.

Rabun County Medical Society has elected the following officers for the coming year: Dr. J. C. Dover, Clayton, President; Dr. J. A. Green, Clayton, Secretary-Treasurer.

Continued on page 26

THE NEW YORK POLYCLINIC
MEDICAL SCHOOL AND HOSPITAL
(ORGANIZED 1881)

(*The Pioneer Post-Graduate Medical Institution in America*)

EYE, EAR, NOSE and THROAT

PLASTIC REPARATIVE SURGERY

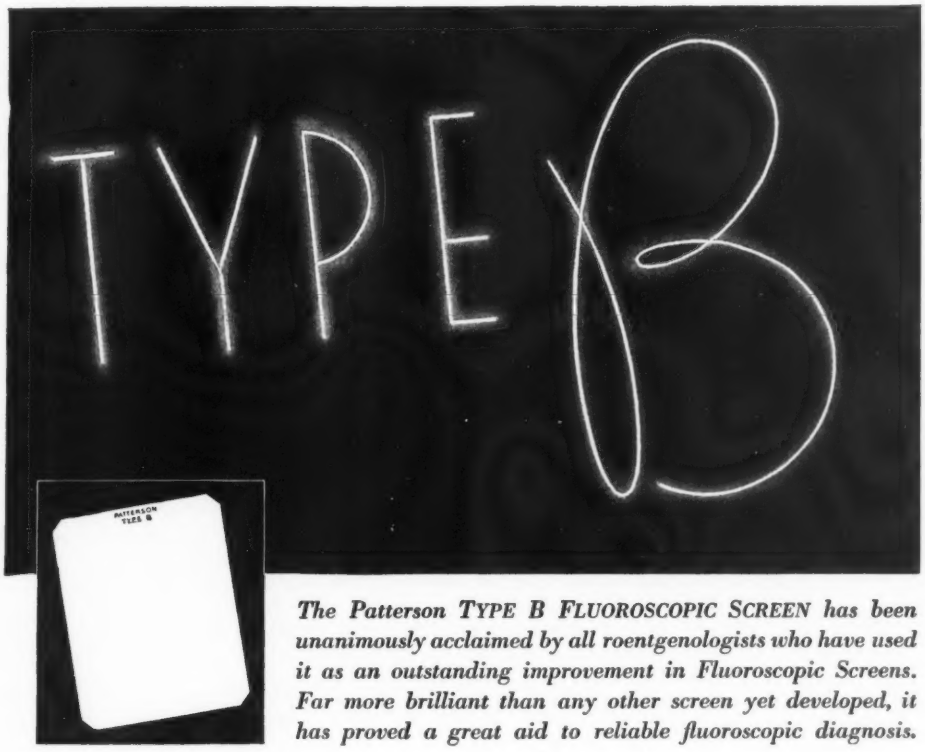
This course includes diagnosis and determination of treatment; pre-operative preparation; anesthesia; operative technique; dressings; post-operative care; with special reference to utilization of the skin and other tissues in correction of disfigurement and replacement of loss, congenital or acquired. Operations on the cadaver. Particular attention is given to lectures, studies and demonstrations of advances in surgical anatomy, pathology, etc., with special reference to the problem actually under consideration.

FOR INFORMATION ADDRESS

MEDICAL EXECUTIVE OFFICER: 345 West 50th Street, NEW YORK CITY

Far more Brilliant!

....THAN ALL PREVIOUS FLUOROSCOPIC SCREENS



The Patterson TYPE B FLUOROSCOPIC SCREEN has been unanimously acclaimed by all roentgenologists who have used it as an outstanding improvement in Fluoroscopic Screens. Far more brilliant than any other screen yet developed, it has proved a great aid to reliable fluoroscopic diagnosis.

THREE marked advantages are possessed by the Patterson TYPE B FLUOROSCOPIC SCREEN. They are: (1) Greatly increased brilliancy; (2) All-around sharper detail; (3) Operation at lower X-ray intensities.

An additional advantage which appeals to many roentgenologists is the apple-green color of this Patterson TYPE B SCREEN—a color to which the eye will accommodate more quickly.

Your dealer will be glad to give you a demonstration of this superior Fluoroscopic Screen.

THE PATTERSON SCREEN CO., TOWANDA, PA., U. S. A.

Patterson

INTENSIFYING X-RAY **Screens** FLUOROSCOPIC

SCREEN SPECIALISTS FOR MORE THAN TWENTY YEARS

The Tulane University of Louisiana

GRADUATE SCHOOL OF MEDICINE

• • •

SPECIAL COURSE: Tropical Medicine and Parasitology lasting six weeks, beginning June 15, ending July 25, 1936.

• • •

For detailed information address the

DEAN, GRADUATE SCHOOL OF MEDICINE

1430 Tulane Avenue

New Orleans, La.

Harvard Medical School Courses for Graduates

INTERNAL MEDICINE
DIAGNOSIS AND TREATMENT

June 18-July 30 (6 weeks). Massachusetts General Hospital. Fee, $200.

MODERN DIAGNOSIS AND TREATMENT OF HEART DISEASE

July 1-31. Peter Bent Brigham Hospital. Fee, $125.

PEDIATRICS

July 1-31. Fee, $125.

CARDIOLOGY — ADVANCED CARDIOLOGY

Cardiology, August. Advanced Cardiology, September. Fee, $150 per course.

For further information regarding the above courses apply to Assistant Dean, Courses for Graduates, HARVARD MEDICAL SCHOOL, Boston, Mass.

Continued from page 24

Jefferson County Medical Society has elected the following officers for the coming year: Dr. J. J. Pilcher, Wrens, President; Dr. G. L. Carpenter, Wrens, Vice-President; Dr. S. T. R. Revell, Louisville, Secretary-Treasurer.

Polk County Medical Society has elected the following officers for the coming year: Dr. S. L. Whitely, Cedartown, President; Dr. C. V. Wood, Cedartown, Vice-President; Dr. John M. McGehee, Cedartown, Secretary-Treasurer.

Clarke County Medical Society has elected the following officers for the coming year: Dr. W. D. Gholston, Danielsville, President; Dr. J. Weyman Davis, Athens, Vice-President; Dr. John A. Simpson, Athens, Secretary-Treasurer.

Colquitt County Medical Society has elected the following officers for the coming year: Dr. T. H. Chesnutt, Moultrie, President; Dr. H. T. Edmondson, Moultrie, Vice-President; Dr. R. M. Joiner, Moultrie, Secretary-Treasurer.

Washington County Medical Society has elected the following officers for the coming year: Dr. N. Overby, Sandersville, President; Dr. R. L. Taylor, Davisboro, Vice-President; Dr. O. D. Lennard, Tennille, Secretary-Treasurer.

Dr. George Lombard Kelly, Augusta, has been appointed Superintendent of the University of Georgia Hospital.

Dr. C. C. Aven, Atlanta, has been elected President of the Atlanta Tuberculosis Association.

Dr. J. R. McCord, Atlanta, has been made full-time Professor of Obstetrics and Gynecology at Emory University School of Medicine.

Dr. Calhoun McDougall, Atlanta, was recently made a member of the Executive Committee of the Medical Interfraternity Conference of the National Association of Medical Fraternity Alumni.

Dr. Eugene E. Murphey and Dr. V. P. Sydenstricker, both of Augusta, were recent speakers before the Science Club at Athens.

Dr. T. R. Aycock and Dr. Philip R. Stewart, both of Monroe, have been made Trustees of the Walton County Hospital.

Dr. Roy R. Kracke, Emory University, was a recent lecturer at the University of Alabama School of Medicine, University, Alabama.

Dr. William E. Mitchell, Atlanta, has moved to the Medical Arts Building.

Dr. Bannester Lester Harbin and Miss Jane E. Goodwin, both of Rome, were married recently.

Dr. Harry Parks and Miss Sylvia Mendel, both of Atlanta, were married recently.

Deaths

Dr. Mansfield William Warner, Atlanta, aged 49, died January 9 of pneumonia.

Dr. Eugene McKay Bailey, Acworth, aged 68, died March 2 of heart disease.

Dr. John W. Taylor, Luthersville, aged 82, died February 25.

Dr. G. W. Nelson, Marshallville, aged 74, died February 26.

Dr. Francis Gilchrist Jones, Atlanta, aged 50, died February 25.

Dr. James M. King, Metcalf, aged 77, died February 8.

Dr. Charles Crawford Hinton, Macon, aged 48, died February 25 of heart disease.

Dr. H. W. Orr, Dublin, aged 75, died February 15.

Dr. James Arthur Lindsay, Cairo, aged 63, died February 8.

KENTUCKY

Boyle County Medical Society has elected the following officers for the coming year: Dr. Stuart P. Hemphill, Danville, President; Dr. D. M. Godby, Perryville, Vice-President; Dr. P. C. Sanders, Danville, Secretary.

Letcher County Medical Society has elected the following officers for the coming year: Dr. C. M. Bently, Neon, President; Dr. C. C. Sparks, Louisville, Vice-President; Dr. J. E. Crawford, Whitesburg, Secretary.

Dr. John B. Floyd, Richmond, was recently appointed to a position on the staff of the State Board of Health, succeeding the late Dr. Jethra Hancock.

Third District Medical Society had as guest speakers at a recent meeting Dr. John C. Burch and Dr. Jefferson C. Pennington, Nashville.

Dr. Jacob N. Bailey and Miss Thelma Elizabeth Drinnon, both of Paducah, were married February 6.

Deaths

Dr. James W. Sams, Crestwood, aged 58, died January 13 from an accidental gunshot wound.

Continued on page 28

Facts you should know about RIPE BANANAS

Easily digested — Non-irritating — Good source of food energy, vitamins, minerals — Pleasant taste

RIPE BANANAS are an easily digested bland food which supplies essential vitamins and minerals, and is popular with most people. They are non-irritating . . . do not ferment easily in the intestines . . . and create intestinal conditions unfavorable to the growth of putrefactive bacteria.

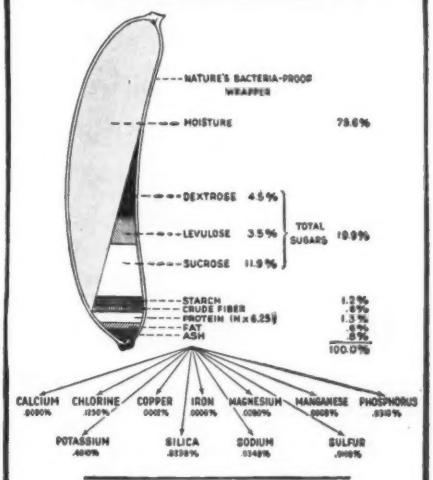
The carbohydrates of a ripe banana comprise about 22% of its total weight when peeled. They consist chiefly of a mixture of sugars—sucrose, dextrose, and levulose—which are readily absorbed, even by infants and young children with gastro-intestinal disturbances.

Besides being an excellent source of food energy, bananas are a good source of Vitamins A, B, C, and G, contribute to the diet important minerals and yield alkaline mineral residues in the body. With their soft fiber, pectins, high content of sugars, low content of protein and fat, and their vitamins, bananas seem adapted to act as a normalizer of colonic functioning.

IT'S EASY TO HAVE RIPE BANANAS ALL THE TIME

Bananas ripen naturally at room temperature. If they are partially ripe when purchased—i.e., in the green-tipped stage—they should be kept at comfortable room temperature (never in the refrigerator) until the pulp has softened and the skin is golden yellow flecked with brown. That is when they're fully ripe and at their very best in flavor.

Proximate Chemical Composition of Fully Ripe Bananas



VITAMINS IN BANANAS

(Sherman Units Per Ounce)

A-100 B-8 C-5 G-10

MAIL COUPON FOR FREE BOOKLET
that tells how bananas can help you in your work.

United Fruit Co., Educational Department,
1 Federal Street, Boston, Massachusetts

Please send me, FREE, my copy of "Dietary Uses of the Banana in Health and Disease," written by a well-known authority on medicine and nutrition.

Name_____

Address_____

City_____ State_____

S. M. J. 5-36

Courses in

LABORATORY TECHNIQUE

Clinical Pathology
Serology
Basal Metabolism
Blood Chemistry
Bacteriology
Parasitology

Eight Months' Training Plus Six Months' Hospital Interneship. Write for descriptive catalogue.

Gradwohl School of Laboratory Technique

3514 Lucas Avenue
St. Louis, Missouri

R. B. H. GRADWOHL, M. D., Director

The Ella Oliver Home

A private maternity home for the care and protection of unfortunate girls during pregnancy and confinement. Under auspices of Women's Christian Association of this city.

Staff physician in daily attendance or may have any other ethical physician. Modern hospital equipment, graduate nurse. Rates very reasonable. Adoption or board arranged for babies.

Strictest privacy is maintained, correspondence confidential.

For information, address

ELLA OLIVER HOME MEMPHIS, TENN.
903 Walker Ave. Phone: 3-0639

Continued from page 26

Dr. Frank Ramey, East Point, aged 69, died January 21 of cerebral hemorrhage.

Dr. L. Otley Pindar, Versailles, aged 65, died January 2.

Dr. James T. Hammonds, Stanford, aged 55, died recently.

Dr. Browder Gaines, Louisville, aged 58, died January 3 of lobar pneumonia.

LOUISIANA

Dr. Ford S. Williams, Oak Grove, was recently appointed Director of the Health Department of St. Mary Parish, succeeding Dr. Wilter W. Poimboeuf, Franklin, resigned.

Dr. Joseph H. Pankey, Monroe, and Miss Vina Gallman were married January 18.

DEATHS

Dr. Charles Jefferson Miller, New Orleans, aged 62, died March 21 of coronary thrombosis.

Dr. Charles Louis Chassaignac, New Orleans, aged 74, died March 21.

Dr. Sidney Dale Porter, Baton Rouge, aged 61, died February 8.

MARYLAND

Dr. Silas W. Weltmer, Catonsville, has been made Superintendent of the Spring Grove State Hospital.

Dr. Ira A. Darling, formerly of Warren, Pennsylvania, has been appointed Superintendent of the Springfield State Hospital, Sykesville.

Dr. Arnold Rice Rich, Baltimore, gave the mid-year Alpha Omega Alpha lecture at the University of Virginia School of Medicine, Charlottesville.

DEATHS

Dr. Nathan Edmondson Berry Iglehart, Baltimore, aged 68, died February 1 of coronary thrombosis.

Dr. Grover Augustus Stem, Baltimore, aged 46, died February 5 of pneumonia.

MISSISSIPPI

Tate County Medical Society has elected the following officers for the coming year: Dr. W. D. Smith, Senatobia, President; Dr. H. L. Murphy, Arkabutla, Vice-President; Dr. J. Sidney Eason, Coldwater, Secretary.

Dr. W. D. Roseborough, formerly of Senatobia, has moved to Sanatorium.

Dr. I. W. Barrett, Clarksdale, recently moved into his new clinic.

Dr. Hugh Curry, Sr., Eupora, now has associated with him Dr. Hugh Curry, Jr.

Dr. Harrison Butler, formerly of Centreville, has moved to Liberty.

Dr. William Marion Hall, Bay St. Louis, and Miss Ella Robinson were married February 19.

DEATHS

Dr. Thornton Austin Moore, Holly Springs, aged 53, died January 17 of coronary thrombosis.

Continued on page 30

THE JEFFERSON MEDICAL COLLEGE of PHILADELPHIA

THE ONE HUNDRED AND TWELFTH ANNUAL SESSION BEGINS SEPTEMBER 21, 1936, AND ENDS JUNE 4, 1937.

FOUNDED 1825. A Chartered University Since 1838. Graduates number 16,042.

FACILITIES: New College Building; Curtis Clinic; Daniel Baugh Institute of Anatomy; Department for Diseases of the Chest; Jefferson Hospital; teaching museums and free libraries; instruction privileges in four other hospitals.

ADMISSION: A college degree based on four years of college work including certain specified science and language courses is required.

ROSS V. PATTERSON, M.D., Dean.

TO SUIT EVERY PATIENT'S NEEDS

THE CONCENTRATED VITAMINS OF COD LIVER OIL

PALATABLE CONVENIENT EFFECTIVE

Your patients more willingly adhere to routine when you prescribe the vitamin-value of cod liver oil in these pleasant, easy-to-take forms.

White's Cod Liver Oil Concentrate provides the *natural* A and D vitamins of cod liver oil, in the *natural* relationship of A to D, and with no fortification by substances from other sources. It offers the known and time-tried cod liver oil vitamins—freed from the objectionable taste and bulk of the oil itself.

Standardized to a potency 100 times greater than cod liver oil* by biological assays repeated at every step throughout manufacture. Presented by one of the world's largest users of cod liver oil for pharmaceutical purposes: **WHITE LABORATORIES, INC., 113 North 13th Street, Newark, N. J.**

FOR INFANTS

Liquid Concentrate for administration in drop dosage. **Two drops = 1 teaspoonful.** Usual prescription price $1.00 for 5 c. c.—the equivalent of 120 teaspoonfuls of Cod Liver Oil.*

FOR CHILDREN AND ADULTS

Concentrate in tablet form. **Each tablet=1 teaspoonful.** Usual prescription price $1.00 for 100 tablets — the equivalent of 100 teaspoonfuls of Cod Liver Oil.*

FOR LARGER DOSAGE

Concentrate in capsule form. **Each capsule=4½ teaspoonfuls.** Usual prescription price is $1.00 for 24 capsules (3 min. each)—the equivalent of 108 teaspoonfuls of Cod Liver Oil.*

Larger packages at even more economical prices.

*U.S.P.XI Minimum Standard

White's Cod Liver Oil products are not advertised to the public, but are promoted exclusively through the medical profession.

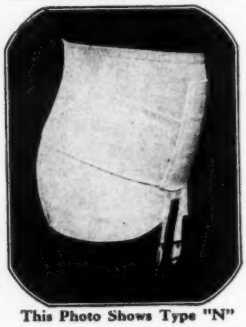
PROMOTED ACCEPTED AMERICAN MEDICAL ASSN. ETHICALLY

White's

COD LIVER OIL CONCENTRATE

Trademark Registered **STORM** Trademark Registered

Binder and Abdominal Supporter



This Photo Shows Type "N"

Gives perfect uplift and is worn with comfort. Made of Cotton, Linen or Silk, washable as underwear.

Three distinct types of Storm Supporters — many variations of each type.

STORM supporters are made for all conditions needing abdominal uplift. Ptosis, Hernia, Pregnancy, Obesity, Relaxed Sacro-Iliac, Articulations, Kidney Conditions, Post-Operative Support, etc.

Each Belt Made to Order **Ask for Literature**

KATHERINE L. STORM, M.D.
Originator, Owner and Maker
1701 Diamond St. **Philadelphia**

"PURITAN MAID"

OXYGEN
ETHYLENE
NITROUS OXID
CYCLOPROPANE
CARBON DIOXID-OXYGEN MIXTURES

Oxygen Tents, Inhaling Outfits, Nasal Catheter Equipment, Etc.

Equipment Rental Service

Puritan Compressed Gas Corp.

Kansas City, Mo. Chicago, Ill. Baltimore, Md.
Cambridge, Mass. Cincinnati, Ohio Detroit, Mich.
St. Louis, Mo. St. Paul, Minn.
Dallas, Texas

Continued from page 28

Dr. William Henry Harrison Lewis, Fayette, aged 69, died January 6 of pneumonia.

Dr. William Alexander Gowan, Kosciusko, aged 56, died January 14 of pneumonia.

MISSOURI

American Medical Association will meet in Kansas City May 11-15.

American Therapeutic Society will meet in Kansas City May 8-9.

American Psychiatric Association will meet in St. Louis May 4-8.

Dr. R. B. H. Gradwohl, St. Louis, Lieutenant Commander, Medical Corps, United States Navy Reserves, has been ordered to duty on board the U. S. S. West Virginia during the Fleet Problem on the Pacific of the United States Fleet.

Dr. Quitman U. Newell and Dr. O. P. J. Falk, St. Louis, were guest speakers before the Perry (Illinois) County Medical Society recently.

Adair-Schuyler County Medical Society was the guest of the Grim-Smith Hospital staff in Kirksville recently.

Deaths

Dr. James Franklin Gullic, Koshkonong, aged 56, died January 17 of carcinoma of the breast.

Dr. David Dee Goldberg, St. Louis, aged 63, died January 23 of angina pectoris.

Dr. William Homer Sitton, Osceola, aged 54, died January 23 of acute nephritis.

Dr. James H. Tinsley, Willard, aged 76, died January 18 of influenza and pneumonia.

Dr. James William Hanan, Kansas City, aged 82, died January 7 of chronic myocarditis.

Dr. Sylvan Elaine H. Rhodes, St. Louis, aged 35, died January 7 of pneumonia.

Dr. David Nathaniel Dabbs, Rocky Comfort, aged 74, died January 18 of cerebral hemorrhage.

Dr. Chett McDonlad, Kansas City, aged 72, died February 13.

NORTH CAROLINA

Mary Elizabeth Hospital, Raleigh, now has associated with it Dr. Kenneth Dickinson, Dr. R. H. Hackler and Dr. Harold Glasscock, Jr.

Dr. John F. Foster, Sanford, has been named the "man of the year" in Lee County.

Dr. Mott P. Blair, Marshville, has been chosen as the outstanding citizen of that city.

Forsyth County Medical Society had as guest speaker at a recent meeting Dr. Hugh Cabot, Rochester, Minnesota.

Raleigh Academy of Medicine had as guest speaker on February 1 Dr. Lawrence T. Royster, University, Virginia.

Dr. Edward R. Baldwin, Saranac Lake, New York, lectured to the Faculty and students of Duke University School of Medicine, Durham, on February 24 and 25.

Dr. S. B. McPheeters, Charlotte, has been made Health Officer of Wayne County, succeeding Dr. C. Fletcher Reeves, resigned.

Dr. Howard T. Holden, formerly of Ravenswood, has moved to Cosby, Tennessee.

Dr. Lorenzo L. Parks, formerly of Auburn, Alabama, has been made Health Officer of Edgecomb County.

Dr. William Turner Ray, Charlotte, and Miss Harriett Mangum were married February 11.

Deaths

Dr. Henry Clay Grubb, Linwood, aged 29, died February 10.

Dr. Henry Theodore Pope, Lumberton, aged 64, died February 12 of influenza and heart disease.

Dr. Seth Jones Montague, Durham, aged 85, died January 28 of carcinoma of the pancreas.

Dr. Charles North Mason, Newport, aged 81, died January 18 of cerebral hemorrhage and diabetes mellitus.

Dr. Robert Cleveland Williams, Wallace, aged 49, died January 27 of coronary thrombosis.

Dr. Augustus C. Boyles, Mount Airy, aged 68, died January 28 of myocarditis.

Dr. Samuel L. Perkins, Wilkesboro, aged 76, died February 27.

Dr. L. V. Grady, Wilson, aged 47, died February 15 of pneumonia.

Dr. C. H. C. Mills, Charlotte, died recently.

Continued on page 32

Diarrhea in Infancy

Take It In Time

Just a day or two of light nourishment prepared from Mellin's Food as suggested below will usually avert an intestinal disturbance that might develop into a serious diarrhea if not taken in hand at the first appearance of loose stools.

Mellin's Food*. . . 4 level tablespoonfuls

Water (boiled, then cooled) . . . 16 ounces

Give one to three ounces every hour or two until the stools lessen in number and improve in character.

The mixture may then be strengthened by the gradual substitution of boiled skimmed milk for water until the quantity of skimmed milk is equal to the normal quantity of milk used in the baby's formula. Finally the fat of the milk may be gradually replaced by skimming less and less cream from the milk.

Samples sent to physicians upon request.

Directions for using Mellin's Food are left entirely to the physician.

Mellin's Food Company, Boston, Mass.

**MELLIN'S FOOD: Produced by an infusion of Wheat Flour, Wheat Bran and Malted Barley admixed with Potassium Bicarbonate — consisting essentially of Maltose, Dextrins, Proteins and Mineral Salts.*

In Convalescence

Recovery after illness or operations is greatly aided through the use of **Horlick's Malted Milk** with its remarkably nourishing and easily digestible qualities. It is readily prepared, appetizing and particularly well suited for cases in which frequent small, light meals are indicated.

Horlick's Malted Milk Tablets possess the same nourishing and digestible qualities as the powder form. They offer a light refreshing lunch, ready for use at any time of the day or night.

HORLICK'S MALTED MILK CORP.
Racine, Wis.

First Aid in Whooping Cough

ELIXIR BROMAURATE

Is giving excellent therapeutic results in

Whooping Cough

- **ELIXIR BROMAURATE** cuts short the duration of the illness, reduces the frequency of the attacks, relieves the distressing cough and gives the child rest and sleep.
- **ELIXIR BROMAURATE** is prescribed routinely by experienced physicians in all COUGH DISORDERS. Also valuable in the cough of PULMONARY TUBERCULOSIS and in BRONCHITIS and BRONCHIAL ASTHMA. Neurologists are using the Elixir with good effect in CHOREA, MIGRAINE and PETIT-MAL.
- **ELIXIR BROMAURATE** is a standard, assayed and palatable preparation. In four-ounce original bottles; the dosage is a teaspoonful 3 to 4 times a day after meals or more often when necessary.

√ **GOLD—An interesting booklet on "Gold in the Treatment of Whooping Cough and Other Diseases" may be had on request. Drop us a card.**

GOLD PHARMACAL CO., New York

Continued from page 30

OKLAHOMA

Dr. Morris Smith, Guymon, has been made Superintendent of Health of Texas County.

Dr. Maurice L. Peter, Blackwell, was recently made Health Officer of Kay County, succeeding Dr. Luther H. Becker, Blackwell.

Dr. Marshall D. Carnell, Okmulgee, has been made Health Officer of Okmulgee County, succeeding the late Dr. John J. C. Rembert.

Dr. Harvey A. Foerster, Ada, is in New York doing postgraduate work.

Dr. Richard B. Ford, Holdenville, is doing postgraduate work in Europe.

DEATHS

Dr. Virgil Henry Barton, McAlester, aged 59, died February 11 from coronary thrombosis.

Dr. J. C. Rembert, Okmulgee, aged 54, died February 12.

Dr. William Mason Cott, Okmulgee, aged 66, died February 7.

SOUTH CAROLINA

South Carolina State Medical Association held its annual meeting in Greenville April 21-23.

Dr. Ruth J. Frank, Spartanburg, and Mr. William Leonard Pugh were married recently.

Dr. Joseph Evans Brunson, Taylors, and Miss Betty Cauble Gibson were married February 9.

DEATHS

Dr. Julius Andrew Mood, Sumter, aged 81, died February 7 of carcinoma of the rectum.

Dr. Allard Memminger, Charleston, aged 81, died January 16 of influenza and bronchopneumonia.

TENNESSEE

Dr. John B. Youmans, Associate Professor of Medicine, Vanderbilt University School of Medicine, Nashville, was recently made Director of Graduate Instruction.

Blount County Medical Society has elected the following officers for the coming year: Dr. L. C. Olin, Maryville, President; Dr. H. A. Callaway, Maryville, Vice-President; Dr. W. C. Crowder, Maryville, Secretary-Treasurer.

Campbell County Medical Society has elected the following officers for the coming year: Dr. A. A. Baird, Pruden, President; Dr. R. Davis, Jellico, Vice-President; Dr. R. J. Buckman, LaFollette, Secretary-Treasurer.

Carroll County Medical Society has elected the following officers for the coming year: Dr. E. W. Hillsman, Trezevant, President; Dr. J. H. Williams, McKenzie, Secretary-Treasurer.

Carter County Medical Society has elected the following officers for the coming year: Dr. E. T. Pearson, Elizabethton, President; Dr. J. B. Shoun, Elizabethton, Vice-President; Dr. E. L. Caudell, Elizabethton, Secretary-Treasurer.

Chester, Henderson and Decatur Counties Medical Society has elected the following officers for the coming year: Dr. C. H. Johnson, Lexington, President; Dr. J. L. McMillen, Decaturville, Vice-President; Dr. L. C. Smith, Henderson, Secretary-Treasurer.

Cocke County Medical Society has elected the following officers for the coming year: Dr. Drew A. Mims, Newport, President; Dr. Charles Ruble, Newport, Vice-President; Dr. J. E. Hampton, Newport, Secretary-Treasurer.

Cumberland County Medical Society has elected the following officers for the coming year: Dr. E. W. Mitchell, Crossville, President; Dr. V. L. Lewis, Crossville, Secretary-Treasurer.

Dickson County Medical Society has elected the following officers for the coming year: Dr. L. F. Loggins, Charlotte, President; Dr. R. P. Beasley, Dickson, Secretary-Treasurer.

Fayette and Hardeman Counties Medical Society has elected the following officers for the coming year: Dr. John Morris Somerville, President; Dr. L. D. McAuley, Oakland, Vice-President; Dr. A. Richards, Bolivar, Secretary-Treasurer.

Fentress County Medical Society has elected the following officers for the coming year: Dr. C. A. Collins, Wilder, President; Dr. A. H. Crouch, Forbus, Vice-President; Dr. J. P. Sloan, Jamestown, Secretary-Treasurer.

Franklin County Medical Society has elected the following officers for the coming year: Dr. W. F. Smith, Decherd, Presi-

Continued on page 34

TRADE **PYRIDIUM** MARK

(Phenylazo-Alpha-Alpha-Diamino-Pyridine Mono-Hydrochloride)

★ URETHRITIS ★

As adjuvant therapy, the oral administration of Pyridium often brings prompt relief of the distressing symptoms which frequently accompany urethritis. Shortening of the duration of treatment and reduction of the number of instances in which complications develop have been reported.

When local treatment is indicated, the use of Pyridium solution may be effectively combined with the oral administration of the tablets. The preparation is non-toxic and non-irritative in therapeutic doses.

Pyridium is available in tubes of 12 and bottles of 50 (0.1 gram) tablets; 1% solution in 100 cc. bottles; powder in 2, 5, and 10 gram bottles; and 1% jelly in 1 oz. collapsible tubes. Descriptive literature will be sent upon request.

MERCK & CO. INC.

Manufacturing Chemists

RAHWAY, N. J.

1538

Continued from page 32

dent; Dr. A. P. Smith, Winchester, Vice-President; Dr. John M. Hardy, Sewanee, Secretary-Treasurer.

Gibson County Medical Society has elected the following officers for the coming year: Dr. L. H. Montgomery, Trenton, President; Dr. H. P. Clemmer, Milan, Vice-President; Dr. F. L. Roberts, Trenton, Secretary-Treasurer.

Giles County Medical Society has elected the following officers for the coming year: Dr. R. E. Warren, Pulaski, President; Dr. J. G. Waldrop, Lewisburg, Vice-President; Dr. T. F. Booth, Pulaski, Secretary-Treasurer.

Hamblen County Medical Society has elected the following officers for the coming year: Dr. P. L. Henderson, Morristown, President; Dr. P. L. Brock, Morristown, Vice-President; Dr. J. F. Campbell, Morristown, Secretary-Treasurer.

Hamilton County Medical Society has elected the following officers for the coming year: Dr. D. M. Williams, Chattanooga, President; Dr. E. A. Gilbert, Chattanooga, Vice-President; Dr. J. Marsh Frere, Chattanooga, Secretary-Treasurer.

Hardin, Lawrence, Lewis, Perry and Wayne Counties Medical Society has elected the following officers for the coming year: Dr. W. E. Boyce, Flatwoods, President; Dr. J. H. Taylor, Morris Chapel, Dr. J. W. Danley, Lawrenceburg, Dr. Paul Wiley, Hohenwald, Dr. W. E. Turner, Lobelville, Dr. D. L. Woods, Waynesboro, Vice-Presidents; Dr. O. H. Williams, Savannah, Secretary-Treasurer.

Haywood County Medical Society has elected the following officers for the coming year: Dr. A. H. Sorrell, Brownsville, President; Dr. John C. Thornton, Brownsville, Vice-President; Dr. Roy M. Lanier, Brownsville, Secretary-Treasurer.

Henry County Medical Society has elected the following officers for the coming year: Dr. A. F. Paschall, Puryear, President; Dr. Elroy Scruggs, Paris, Vice-President; Dr. R. Graham Fish, Paris, Secretary-Treasurer.

Hickman County Medical Society has elected the following officers for the coming year: Dr. L. F. Pritchard, Only, President; Dr. C. V. Stephenson, Centerville, Vice-President; Dr. W. K. Edwards, Centerville, Secretary-Treasurer.

Classified Advertisements

COMPLETE used x-ray outfit, including generator, table, timer, tubestand, and accessories. Very attractive price. Inquire PXC, care of THE JOURNAL.

ASSISTANCE OFFERED TO MEDICAL WRITERS. Research. Abstracts. Translations (all languages). Papers prepared from author's data. Ten years' experience with leading physicians and appointments on medical journals of highest standing. I employ no assistants; all my work is done personally and is reliable. Florence Annan Carpenter, 413 St. James Place, Chicago, Ill.

ALCOHOLISM (30 years' experience)—THE STOKES HOSPITAL, 923 Cherokee Road, Louisville, Kentucky. Telephone, East 1488. Absolute privacy. Treatment one of gradual reduction. Do not limit the quantity of whiskey used in treatment. Each patient treated as an individual case. Craving for alcoholic beverages destroyed; no physical injury incurred. Rates and folder on request.

The "MESCO" Laboratories manufacture the largest line of Ointments in the world. Sixty different kinds. We are originators of the Professional Package. Specify "MESCO" when prescribing ointments. Send for lists.

Manhattan Eye Salve Co.

LOUISVILLE, KENTUCKY

Davidson County Medical Society had as guest speaker at a recent meeting Dr. E. R. Kellersberger, Bibanga, Congo Belge, Africa.

Madison County Medical Society had as guest speaker at its meeting on February 26 Dr. Morris Fishbein, Chicago, Illinois.

Chattanooga and Hamilton County Medical Society had as guest speaker at its meeting on February 13 Dr. John T. Murphy, Toledo, Ohio.

Dr. Alonzo E. Hardison, Jr., Marysville, has been made Director of the Blount County Health Department, succeeding Dr. Owen F. Agee, Marysville, resigned.

Dr. William D. Burkhalter, formerly of Nashville, has been made Health Officer for the newly organized Health Department of Coosa County, Alabama.

Dr. Howard T. Holden, formerly of Ravenswood, North Carolina, has moved to Cosby.

DEATHS

Dr. Isaac Newton Moyers, Speedwell, aged 76, died recently.

Dr. William D. Rogers, Coalmont, aged 68, died January 20 of pneumonia.

Dr. Percy A. Perkins, Memphis, aged 53, died February 20 of pneumonia.

TEXAS

Post-Graduate Medical Assembly of Southwest Texas has elected the following officers for the coming year: Dr. Roy T. Goodwin, San Antonio, President; Dr. C. A. Poindexter, Crystal City, Dr. J. G. Webb, Mercedes, Vice-Presidents.

Brazoria County Medical Society has elected the following officers for the coming year: Dr. S. B. Maxey, Angleton, President; Dr. Marcus Weems, Columbia, Vice-President; Dr. Brooks Stafford, Angleton, Secretary-Treasurer.

Caldwell County Medical Society has elected the following officers for the coming year: Dr. Joe B. Coopwood, Lockhart, President; Dr. Jessie W. Pryor, Luling, Vice-President; Dr. H. B. Henry, Luling, Treasurer.

Cherokee County Medical Society has elected the following officers for the coming year: Dr. J. B. Ramsey, Forest, President; Dr. Lawrence T. Smith, Rusk, Vice-President; Dr. T. H. Cobble, Rusk, Secretary-Treasurer.

Fannin County Medical Society has elected the following officers for the coming year: Dr. A. B. Kennedy, Bonham, President; Dr. William L. Southerland, Leonard, Vice-President; Dr. L. C. Biggers, Bonham, Secretary-Treasurer.

Gregg County Medical Society has elected the following officers for the coming year: Dr. J. D. Baucum, Longview, President; Dr. Hardy Cook, Longview, Vice-President; Dr. Morris Velinsky, Kilgore, Secretary-Treasurer.

Liberty Chambers Counties Medical Society has elected the following officers for the coming year: Dr. J. D. Spear, Liberty, President; Dr. George Fahring, Anahuac, Vice-President; Dr. E. J. Tucker, Liberty, Secretary-Treasurer.

Valley Baptist Hospital Staff, Harlingen, has elected the following officers for the coming year: Dr. George L. Gallaher, Harlingen, President; Dr. R. E. Utley, Harlingen, Vice-President; Dr. J. D. Casey, San Benito, Secretary-Treasurer.

Dr. Ximie R. Hyde, Fort Worth, has been elected President of the Texas Radiological Society.

Dr. William B. Carrell, Dallas, has been made Vice-President of the American Academy of Orthopedic Surgeons.

Dr. L. L. Edwards, San Marcos, was recently installed as Eminent Commander of the San Marcos Commandery of the Knights Templar.

Dr. H. Goodall Wooten, Austin, has been made President of the Chamber of Commerce of that city.

Dr. W. P. Hillips, Greenville, has been made President of the Exchange Club of that city.

Harris County Medical Society had as guest speaker at a recent meeting Dr. James C. White, Boston, Massachusetts.

Dr. James A. Willie, Houston, has opened an office in the Medical Arts Building.

Dr. F. W. Hover, Sealy, is in New Orleans, Louisiana, doing postgraduate work.

Dr. C. E. Alexander, formerly of Lufkin, has moved to Hemphill.

Dr. George A. Bennack has moved from Schulenburg to Flatonia.

Dr. Maurice C. Barnes has moved from Coleman to Waco.

Dr. Zachery Causey has moved from El Paso to Douglas, Arizona.

Dr. H. G. Clark has moved from Dallas to Fairfield, Alabama.

Dr. R. L. Futrell has moved from Ganado to Del Rio.

Dr. T. L. Gardner has moved from Camden to Teague.

Continued on page 36

CONSIDER THE RADISH!

IT arrives in the Spring along with the succulent green onion and fresh garden lettuce. Unfortunately, Spring's contributions to the family table frequently carry organisms which cause diarrhea.

As in cases of "ptomaine poisoning", simple or infectious colitis, Kaomagma adsorbs bacterial toxins and products of putrefaction, soothes the inflamed mucosa, promptly consolidates liquid feces and reduces too frequent stools to normal.

Kaomagma is an emulsoid of finest medicinal kaolin activated by fluid dispersion in Alumina Gel. Kaomagma Plain and Kaomagma with Mineral Oil are available in 12-ounce bottles at your prescription pharmacy . . .

Send for literature and samples of

KAOMAGMA

JOHN WYETH & BROTHER, INCORPORATED

PHILADELPHIA, PA. **WALKERVILLE, ONT.**

Continued from page 34

Dr. F. D. Garrett has moved from St. Petersburg, Florida, to El Paso.

Dr. E. A. Hancock has moved from Breckenridge to Ranger.

Dr. John M. Hooper has moved from Pampa to Sanatorium.

Dr. John D. Hunt has moved from Aquilla to Forsan.

Dr. Patrick O. Lowe has moved from Hillsboro to Groesbeck.

Dr. Joseph Maldonado has moved from Mercedes to Santa Fe, New Mexico.

Dr. K. W. Rowe has moved from Terrell to Kerens.

Dr. Henry Schwartze has moved from Junction to Las Cruces, New Mexico.

Dr. J. D. Simpson has moved from San Francisco, California, to McAllen.

Dr. Lindsey Smith has moved from Big Sandy to Mesquite.

Dr. E. W. Tisdale has moved from Fort Worth to Los Angeles, California.

Dr. H. G. Williams has moved from Dallas to Phoenix, Arizona.

Dr. R. B. Wolford has moved from Paris to Bonham.

Dr. Samuel V. Granata, Beaumont, and Miss Ruth Steegall were married recently.

Deaths

Dr. Robert Scrivner Lipscomb, Grapevine, aged 76, died January 26 of pneumonia.

Dr. B. F. Largent, McKinney, aged 49, died January 17 of cerebral hemorrhage.

Dr. Gustave Adolphus Wedemeyer, Taylor, aged 61, died January 24 of mastoiditis and diabetes mellitus.

Dr. Charles Theodore Doremus, San Antonio, aged 74, died January 14 of chronic myocarditis.

Dr. William Burton Thorning, Houston, aged 63, died February 12 of coronary thrombosis.

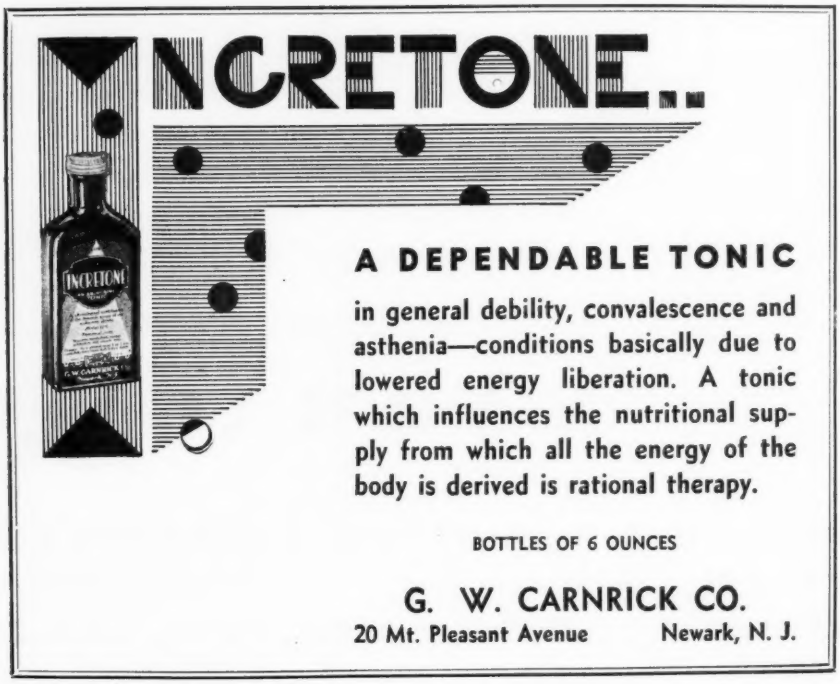
Dr. William Edward McCaleb, Austin, aged 64, died recently.

Dr. George F. Brown, Sherman, aged 65, died February 4 of heart disease.

Dr. Marcus P. Smartt, Austin, aged 64, died February 5 of pneumonia.

Dr. George B. Wade, Jacksboro, aged 72, died recently of heart disease.

Continued on page 40


INCRETONE..
A DEPENDABLE TONIC
in general debility, convalescence and asthenia—conditions basically due to lowered energy liberation. A tonic which influences the nutritional supply from which all the energy of the body is derived is rational therapy.
BOTTLES OF 6 OUNCES
G. W. CARNRICK CO.
20 Mt. Pleasant Avenue Newark, N. J.

"WE'VE NEVER LOST A FATHER, YET!"

But How About A Doctor?

The recovery of newly-made fathers is proverbial. Some thought, however, might well be given to the physician in charge of the case. If the obstetrician is free from worry concerning postpartum hemorrhage, he may be able to find that much needed rest which even physicians require.

Wyeth's Ergoklonin, a standardized, stable and palatable solution, containing the new ergot alkaloid, ergostetrine, produces strong, rhythmic uterine contractions in an average of five minutes, which last for three to five hours.

In anaesthetized or nauseated patients it may be given by rectum, with efficient response in one or two minutes.

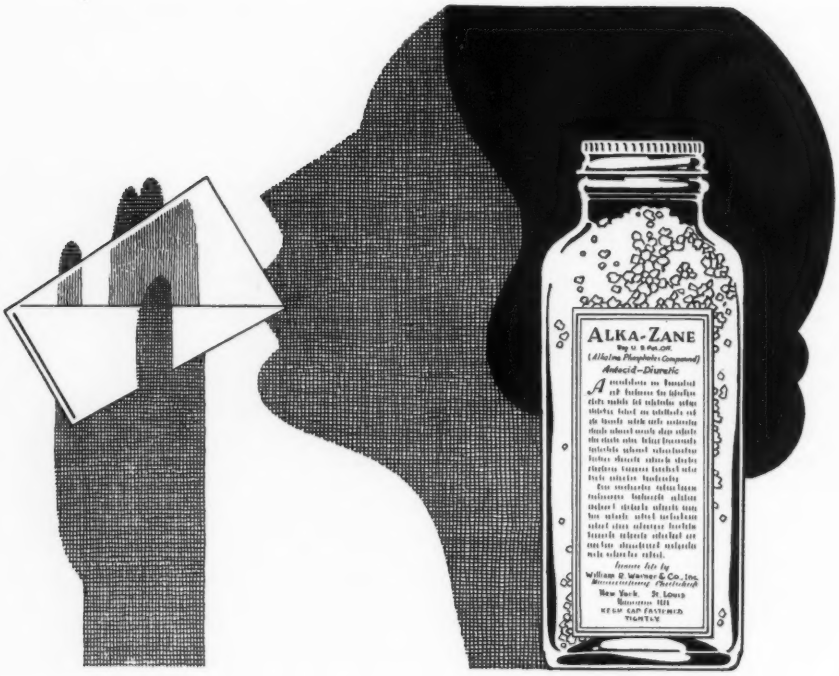
The physician need not worry about postpartum hemorrhage if he prescribes

ERGOKLONIN

Literature will be sent to physicians on request

JOHN WYETH & BROTHER, INCORPORATED

PHILADELPHIA, PA. WALKERVILLE, ONT.



When Acidosis Complicates Disease

Supporting the alkali reserve has become a routine measure in diseases characterized by acidosis. For this purpose, Alka-Zane is extensively used because it supplies the four bases of which the reserve is essentially composed: sodium, potassium, calcium, magnesium. These are made available to the organism in the form of carbonates, citrates and phosphates. Alka-Zane contains no tartrates, lactates, or sulphates, and no sodium chloride. It is a convenient and efficient way to prescribe alkalizing medication that is palatable and easy to take.

Alka-Zane is supplied in 1½, 4 and 8 ounce bottles. Trial supply sent on request.

ALKA-ZANE

WILLIAM R. WARNER & CO., Inc., 113 West 18th Street, New York City

AQUA DOUBLE DISTILLED DEAERATED Q. S.

Which gives only one example of the extreme care with which Man-Na-Gluconate is made . . . and why this clear, aqueous colloidal manganese sodium gluconate in fine colloidal dispersion with alcohol benzylic as a local anesthetic, is so successfully used for *boils, acne, chronic ulcers* and other *suppurative conditions.*

MAN-NA-GLUCONATE

Reg. U. S. Pat. Off.

Manganese Sodium Gluconate Colloidal

U. S. Patent No. 1,962,371

remains stable indefinitely. In most cases, only a few injections are needed to clear up suppuration and to stimulate healing of lesions. Man-Na-Gluconate injections are practically painless when made at a depth of 1½ to 2 inches intragluteally in the upper inner quadrant.

Man-Na-Gluconate is supplied in Hyposols (ampuls) of 1 cc, 12 and 25 to the box.

Familiarize yourself with Man-Na-Gluconate.
Send for literature.

THE DRUG PRODUCTS CO., Inc.
26-41 Skillman Avenue
LONG ISLAND CITY, NEW YORK
Makers of Hyposols Sulisocol—Hyposols Ca-Malacol
Pulvoids Digitalis Folium—Pulvoids Natrico

EST. 1913

The Drug Products Co., Inc., specialties available through:

Red Star Surgical Co., Chattanooga, Tenn.; White Surgical Supply Co., Inc., Knoxville, Tenn.; Benjamin Pope's Apothecary, Memphis, Tenn.; Karl Wood's Apothecary, Memphis, Tenn.; Massey Surgical Supply, Inc., Nashville, Tenn.; Doster-Northington, Birmingham, Ala.

THE DRUG PRODUCTS CO., Inc. SM-5
26-41 Skillman Avenue, Long Island City, N. Y.
I should like to receive literature on Man-Na-Gluconate.
....., M.D.
St. and No.....
City..... State.....

Continued from page 36

Dr. Elkonah Payne, Lakeview, aged 64, died January 14 of pneumonia.

VIRGINIA

Warwick County Medical Society has elected the following officers for the coming year: Dr. Waverly R. Payne, Newport News, President; Dr. Harvey G. Bland, Newport News, Secretary.

Albemarle County Medical Society has elected the following officers for the coming year: Dr. W. H. Paine, Charlottesville, President; Dr. E. C. Drash, University, Vice-President; Dr. Arthur M. Smith, Charlottesville, Secretary.

James City-New Kent County Medical Society has elected the following officers for the coming year: Dr. B. I. Bell, Williamsburg, President; Dr. E. B. Kilby, Toano, Vice-President; Dr. F. R. Person, Williamsburg, Secretary-Treasurer.

Children's Memorial Clinic of Richmond has elected the following officers for the coming year: Dr. Howard R. Masters, President; Dr. Charles L. Outland, Vice-President.

Dr. S. K. Ames, Cape Charles, was recently made a Director of the Chamber of Commerce of that city.

Dr. Fred J. Wampler, Richmond, has been made Medical Adviser to the WPA of Virginia.

Dr. T. M. Parkins, Staunton, has been made Health Officer of Staunton, succeeding Dr. J. Fairfax Fulton.

Richmond Academy of Medicine had as guest speaker on March 10 Dr. Charles Hendee Smith, New York City.

Dr. L. R. Broster, Surgeon to Charing Cross Hospital, London, England, was a recent speaker at the Richmond Academy of Medicine.

Dr. John B. Bullard, Richmond, has opened offices on Monument Avenue.

Dr. Meyer Cohen, formerly of Richmond, has moved to Westernport, Maryland.

Dr. John Glen McNeil, Pennington Gap, and Miss Mary Roberta Kuyk were married recently.

DEATHS

Dr. William Otey McCabe, Thaxton, aged 65, died January 18 of coronary occlusion.

Dr. Addison Barrett Householder, Lovettsville, aged 66, died March 20 from a heart attack.

Dr. Claudius Pugh Hutchison, Purcellville, aged 60, died March 5 from pneumonia.

Dr. Peyton Paige Nottingham, Ferrum, aged 55, died March 10.

Dr. Charles Curtis Page, Richmond, aged 72, died March 8.

Dr. Willcox Ruffin, Norfolk, aged 35, died February 28.

Dr. Rawley Martin Shelton, Unionville, aged 65, died March 15 from pneumonia.

Dr. Samuel I. Conduff, Roanoke, aged 62, died March 19.

Dr. James Braxton McKee, Glade Spring, aged 76, died March 17.

WEST VIRGINIA

Dr. G. H. Barksdale, Charleston, was made a Fellow of the American College of Physicians at its recent meeting in Detroit and Dr. Walter E. Vest, Huntington, was elected to the Board of Governors.

Parkersburg Academy of Medicine had as guest speaker at a recent meeting Dr. John Weykoff, New York City.

Raleigh County Medical Society had as guest speaker at a recent meeting Dr. James King, Radford, Virginia.

Dr. C. C. Coleman, Richmond, Virginia, was guest speaker before the Kanawha County Medical Society at its meeting on March 10.

Dr. G. W. Grier, Pittsburgh, Pennsylvania, was guest speaker before the Ohio County Medical Society at a recent meeting.

Dr. F. W. Light, formerly of Clarksburg, has moved to Illinois.

Dr. Herbert M. Coleman and Miss Grace Perdue, both of Iaeger, were married January 26.

DEATHS

Dr. Joseph Cabell Jett, Spring Dale, aged 56, died January 19.

Dr. John T. Carter, Triadelphia, aged 85, died March 6.

Nupercainal
W
E
S
the LOCAL ANESTHETIC OINTMENT of PROLONGED ACTION
Makes the patient comfortable under trying circumstances
North, East, South, West, physicians find that Nupercainal, "Ciba", by emollient and penetrating local anesthetic actions, promptly takes the pain and sting out of sunburn and other superficial burns. It is antipruritic and an aid in healing. Relief is prolonged.
Other Indications:—Itching and distress of hemorrhoids, pruritus ani et vulvae, various dermatoses, decubitus, cracked nipples, anal fissures, etc.
Try Nupercainal clinically. Send for free trial sizes and literature.
CIBA COMPANY, INC., NEW YORK, N. Y.
Ciba
Nupercainal is issued in tubes (with removable paper labels) of one ounce and in tins of one pound.

FOR CONSTIPATION • SPASTIC COLITIS

STIMULATING NORMAL PERISTALSIS BY BLAND DISTENTION

The ideal therapeutic agent for correcting these entities should meet the following requirements:

(1) supply bland, non-irritating bulk

(2) have a jel-like, *viscous tenacity* to unite fragmented stools during the diarrheal stage

(3) not interfere with digestion

(4) not leak

MUCILOSE

(STEARNS)

Satisfies These Requirements Fully

Mucilose is a hemicellulose (a vegetable-gum) prepared by a special process from the Plantago loeflingii.

Mucilose gently stimulates normal peristalsis without irritation — does not absorb vitamins from the intestinal tract — gives the desired *large, formed, easily-passed soft stools.*

EFFECTIVE
EASY TO TAKE
ECONOMICAL

FREDERICK STEARNS & COMPANY

DETROIT NEW YORK KANSAS CITY SAN FRANCISCO
WINDSOR, ONTARIO SYDNEY, AUSTRALIA

FREDERICK STEARNS & COMPANY Dept. S. M. 5
Detroit, Michigan

Please send me a supply of Mucilose for clinical test.

*Dr.*_____ *Address*_____

*City*_____ *State*_____

Now Ready—

CAPSULES of MEAD'S OLEUM PERCOMORPHUM

25 soluble gelatin capsules in a box

Not advertised to the public

IN PREGNANCY AND LOW-CALORIE DIETS

and wherever vitamins A and D are required with minimum added calories

RESTRICTED diet regimens, as for the obese, know no season for vitamin therapy. Because of the frequent drain on the mother's stores and the added requirement of the fetus, the need for vitamins A and D is increased during pregnancy. Yet, it is in just such cases that there may be an aversion or intolerance to fats. In the obese, who studiously avoid butter, cream and other good sources of vitamin A, the deficiency should be made up. This can be done in a convenient and highly acceptable manner by prescribing Mead's Capsules of Oleum Percomorphum, which combine a high potency of both vitamins A and D. Each 10-drop capsule supplies natural vitamins in amounts not less than 13,300 A units and 1,850 D units (U.S.P.). Every capsule represents more than 5 teaspoonfuls of cod liver oil* in vitamins A and D. These vitamins, moreover, are in the same ratio as in cod liver oil.*

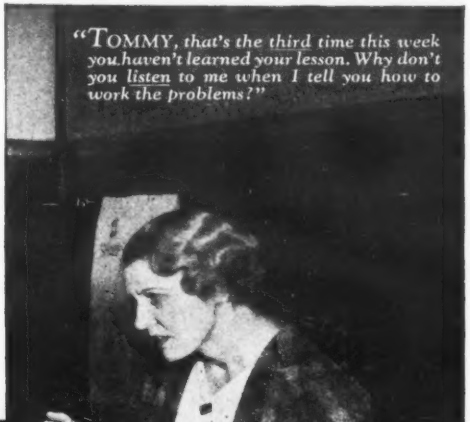
*U.S.P. XI Minimum Standard

For physicians who prefer Mead's Viosterol in Halibut Liver Oil, 3-minim capsules containing not less than 8,500 vitamin A units and 1,700 vitamin D units (U.S.P.) are available.

MEAD JOHNSON & COMPANY, Evansville, Indiana, U. S. A.

Please enclose professional card when requesting samples of Mead Johnson products to cooperate in preventing their reaching unauthorized persons

A Poor Scholar . . . because of a Poor Breakfast


"TOMMY, that's the third time this week you haven't learned your lesson. Why don't you listen to me when I tell you how to work the problems?"

MANY a child is scolded for dullness when he should be treated for undernourishment. In hundreds of homes a "continental" breakfast of a roll and coffee is the rule. If, day after day, a child breaks the night's fast of twelve hours on this scant fare, small wonder that he is listless, nervous, or stupid at school.

Pablum offers a happy solution to the problem of the school-child's breakfast. Mothers who learn about Pablum from their physicians are delighted to serve it for it needs no cooking and can be prepared in a minute at the table—more quickly than many less nourishing foods. Pablum not only ends the bane of long cooking of cereals but in addition furnishes a variety of minerals (calcium, phosphorus, iron, and copper) and vitamins (A, B, G, and E) not found so abundantly in any other cereal.

PABLUM is rich in calcium and iron, minerals likely to be deficient in the school-child's diet yet needed in more than average amounts during childhood. Pablum is 6 times richer than fluid milk in calcium and contains 10 times more iron than does spinach. It also furnishes generous amounts of vitamins B and G, essential for normal appetite. Unlike other cereals, Pablum is base-forming, important because the growing child needs to store alkali. The nutritional value of Pablum is attested in studies by Crimm *et al* who found that tuberculous children receiving supplements of Pablum showed greater weight-gain, greater increase in hemoglobin, and higher serum-calcium values than a control group fed farina. Reprint sent on request of physicians. Mead Johnson & Company, Evansville, Ind., U.S.A.

Pablum (Mead's Cereal thoroughly cooked) is a palatable cereal enriched with **vitamin- and mineral-containing foods, consisting of wheatmeal, oatmeal, cornmeal, wheat embryo, alfalfa leaf, beef bone, brewers' yeast, iron salt, and sodium chloride.**

Please enclose professional card when requesting samples of Mead Johnson products to cooperate in preventing their reaching unauthorized persons

"Past Regrets and Future Fears"

In addition to difficulty in putting away the cares and worries of "dead yesterday" and "unborn tomorrow" some of your sleepless patients have the additional hurdle of fear. Fear—engendered by recollection of other sleepless nights—that sleep, so much needed, will again elude them; fear that continued loss of sleep will break down health.

Insomnia, whatever its cause, may easily become chronic, and establishment of normal sleep habits frequently requires temporary use of a hypnotic.

Ortal Sodium is effective—one five-grain capsule will usually induce quiet, restful sleep (a three-grain capsule is often sufficient). Its effect is not unduly prolonged; the patient is usually alert and refreshed the following morning.

Ortal Sodium (sodium hexyl-ethyl barbiturate) is supplied in capsules of 3/4, 3, and 5 grains, in bottles of 25, 100, and 500.

★

PARKE, DAVIS & COMPANY